

Social Facilitation: A Meta-Analysis of 241 Studies

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This article reports a meta-analysis of the effects of the presence of others on human task performance and physiology. In 241 studies involving nearly 24,000 subjects, the presence of others had small effects, accounting for .3% to 3% of the variance in the typical experiment. We conclude that (a) the presence of others heightens an individual's physiological arousal only if the individual is performing a complex task; (b) the presence of others increases the speed of simple task performance and decreases the speed of complex task performance; (c) the presence of others impairs complex performance accuracy and slightly facilitates simple performance accuracy, though the facilitation is vulnerable to the "file drawer problem" of unreported null results; and (d) social facilitation effects are surprisingly unrelated to the performer's evaluation apprehension. These meta-analytic conclusions are contrasted with conclusions reached by narrative literature reviews. Implications for theories of social facilitation are discussed.

Since beginning their study of social influence, psychologists have been interested in a minimal source of influence: the mere presence of others. In the first investigation, Triplett (1898) found that adolescents could spin fishing reels more quickly when in coacting pairs than when alone. In other early research, Pessin (1933) discovered that college students made more errors in memorizing nonsense syllables if they learned the syllables in front of a spectator. From such pioneering efforts, a massive research literature grew, a literature that has documented social effects on the performance of myriad tasks. Many researchers (following Triplett, 1898) have found that the presence of others can facilitate task performance; other investigators (following Pessin, 1933) have observed that performance can be impaired by the presence of others. The pres-

ent article reports a quantitative review of 241 empirical studies on the social facilitation and impairment of human task performance. Theories of social facilitation provide a framework for appreciating this wealth of evidence.

The Drive Theory of Social Facilitation

Robert Zajonc (1965) appropriated concepts from Hull-Spence behavior theory to explain social effects on task performance. Hull-Spence theory (Hull, 1943; Spence, 1956) represents behavior as a multiplicative function of habit strength and generalized drive: In Hull's mathematical notation, $E = f(H \times D)$, where E , H , and D represent excitatory potential toward a behavior, habit strength, and generalized drive, respectively. According to the theory, habits are evoked by stimuli. A stimulus may evoke a single habit or several mutually exclusive habits. Generalized drive is an indiscriminant energizer of habits. If the stimulus has evoked a single habit, generalized drive should increase the probability and speed of the corresponding response. If the stimulus has evoked a hierarchy of mutually exclusive habits, generalized drive should multiply differences in habit strength. This should increase the probability of the strongest (i.e., dominant) response and decrease the probability of each weaker (i.e., subordinate) response.

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Zajonc (1965) suggested that the presence of others increases an individual's level of generalized drive (D), enhancing the individual's dominant response tendency more than competing response tendencies. A simple task, Zajonc reasoned, is a task in which the performer's dominant tendency is to give the correct response; a complex task is one in which the dominant tendency is toward some incorrect response. By enhancing the dominant response, the presence of others should facilitate simple task performance and impair complex task performance. In 1965, Zajonc cited evidence that was consistent with these two predictions; today, drive theory is the most widely accepted explanation for the effects of the presence of others (Moore & Baron, in press).

Drive theorists disagree about the antecedents of social drive and about the minimal social condition sufficient to trigger the drive. Zajonc (1980) interpreted the drive produced by the presence of others as an alertness for the unexpected, a preparedness to respond to the potential actions of others. This drive, Zajonc maintained, will be generated by the presence of any potentially active other, even an other who is not competing with the individual, who cannot evaluate the individual, and from whom the individual can anticipate no reward or punishment.

Cottrell (1972) argued that the mere presence of others will not increase drive. Cottrell claimed that the individual learns from socialization experiences when to anticipate positive and negative outcomes by virtue of the presence of others. These anticipations, rather than the presence of others, constitute the immediate source of generalized drive. Hence drive should be generated only by others who have the potential to evaluate the individual's performance. Weiss and Miller (1971) added that this learned drive is an aversive state, an apprehension of others' negative evaluations.

Sanders, Baron, and Moore (1978) attributed social drive to an attentional conflict. The individual seeks information regarding the adequacy of his or her performance. Hence the presence of others who can supply social comparison data will attract the performer's attention, and (as Hollingworth had

noted in 1935) attention to such others will conflict with attention to the task at hand. Sanders, Baron, and Moore (1978) claimed this attentional conflict as a source of generalized drive. Their distraction-conflict theory has a counterintuitive appeal because it invokes the concept of distraction to explain performance facilitation. The presence of others, say these theorists, will increase drive only if the performer attends to the others and this attention conflicts with attention to the task.

Guerin and Innes (1982) offered a similar analysis, contending that the individual will monitor others when such monitoring is possible. Guerin and Innes, however, did not attribute social drive to distraction. Rather, the presence of others who cannot be visually monitored will increase drive, as will the presence of others who are unfamiliar, unpredictable, or threatening. Drive will not be increased by the mere presence of innocuous others if those others can periodically be monitored. According to this social monitoring theory, the individual should be less affected by the presence of coactors than by the presence of spectators because coactors are more predictable.

Other Theories

Psychologists have proposed alternatives to the drive theory of social facilitation. Duval and Wicklund (1972) offered a nondrive theory, contending that the presence of others heightens a performer's objective self-awareness. Theoretically, the self-aware performer should note discrepancies between his or her task performance and performance ideals and should be motivated to reduce these discrepancies. Duval and Wicklund attributed social facilitations of performance to the performer's efforts at discrepancy reduction. Carver and Scheier (1981) characterized such efforts as a matching-to-standard, a cybernetic process that entails a negative feedback loop. Self-awareness theorists have several explanations for social impairments of performance: dysfunctionally high levels of effort (Duval & Wicklund, 1972), diversions of attention needed by the task (Wicklund, 1975), and disengagements from perfor-

mance when discrepancies seem impossibly large (Carver & Scheier, 1981). These theories predict that self-focusing stimuli (like mirrors) should have the same effects on task performance as does the presence of others.

Borrowing some old concepts (see Goffman, 1967; Woolbert, 1916), Bond (1982) proposed a self-presentational analysis of social facilitation. This analysis contends that the performer will be motivated to project an image of competence in the presence of others. The presence of others should facilitate performance if this image can be sustained. However, the performer who infers that he or she appears inept will become embarrassed and suffer a social impairment of performance. The performer, Bond assumed, can sustain an image of competence on a simple task; that is, a task on which most responses are correct. The same performer would infer failure on a complex task; that is, a task on which most responses are incorrect. By linking perceived failure to task complexity, this self-presentational analysis follows drive theory in predicting the social facilitation of simple performances and the social impairment of complex performances. The theories, though, make different physiological predictions. Drive theorists who (e.g., Zajonc, 1980) equate drive with physiological arousal predict that the presence of others will invariably increase an individual's physiological arousal. The self-presentational analysis depicts arousal as a correlate of embarrassment, implying that the presence of others should heighten arousal only if the individual is attempting a complex (i.e., embarrassing) task (Bond, Note 1).

Which of these theories is most consistent with the results of research? What are the effects of the presence of others on task performance and physiology? To answer such questions, the student of social facilitation turns to literature reviews.

Existing Reviews

Many reviews of social facilitation research have appeared over the years. They have differed in scope. Burnham (1910) summarized the handful of studies that had been

conducted prior to his pioneering review. A quarter of a century later, Dashiell (1935) could cite 15 experiments on adult human task performance. Zajonc (1965) included 35 references in a well-known theoretical review; he cited 76 sources in a follow-up review published in 1980. Cottrell (1972) summarized 55 studies of the social facilitation of human and animal behavior. Landers and McCullagh (1976) reviewed 84 experiments on human motor performance. Geen and Gange (1977) based their social facilitation review on 99 studies published between 1965 and 1977. Blank (Note 2) used 36 older references in an unpublished review. In reviews that focused on theoretical issues, Sanders (1981a) included 44 studies; Guerin and Innes (1982) included 21 studies.

Reviewers do not agree on the effects of the presence of others. Some (e.g., Cottrell 1972; Geen & Gange, 1977; Zajonc, 1980) concluded that—consistent with drive theory—the presence of others facilitates the performance of simple tasks and impairs the performance of complex tasks. Landers and McCullagh (1976), however, maintained that these conclusions are valid only for quantitative (i.e., speed or endurance) tasks; the presence of others, they say, has no consistent effects on simple or complex performance quality. Blank (Note 2) drew yet another conclusion from this literature: The presence of others often reduces simple performance quantity.

Will others who are merely present influence an individual's task performance, as Zajonc claimed? Or must the others, as Cottrell argued, be in a position to evaluate the individual's performance? On this matter, reviewers have reached all possible conclusions. Zajonc (1980) found the mere presence of others sufficient to facilitate and impair performance; indeed, his mere presence position is "consistent with most of the social facilitation literature" (Zajonc, 1980, p. 50). Sanders (1981a, p. 237) cited "numerous studies in which the presence of others failed to produce social facilitation," and concluded that, relative to Cottrell's learned drive analysis and his own distraction-conflict theory, Zajonc's mere presence position "fares least well by far" (Sanders, 1981a, p. 244). Landers and McCullagh (1976) endorsed the third log-

ical alternative, maintaining that the "mere presence vs. evaluation apprehension controversy has evidence to support both sides" (p. 152). Such disagreements inspire a critical scrutiny of existing reviews.

All reviews of social facilitation to date have been narrative reviews. They provide an experiment-by-experiment verbal description of methods and results, drawing conclusions from a logical analysis of the evidence. Recent reviews (Guerin & Innes, 1982; Sanders, 1981a) supplement these narrative techniques with a "voting method" of research synthesis (Light & Smith, 1971). Such reviews categorize each effect of the presence of others as significantly favorable to performance, significantly detrimental to performance, or nonsignificant. They count the number of effects in each category. If no category receives a plurality of "votes," the effect of the presence of others is said to be inconsistent; otherwise, an effect is inferred from the winner of the tabulation.

Existing reviews yield an incomplete description of social facilitation and impairment. No review to date has specified the method by which relevant studies have been located. Blank (Note 2) maintained that reviewers have selectively omitted pertinent studies. Social facilitation reviewers have used the criterion of statistical significance in gauging effects of the presence of others, though statistical significance depends on sample size in addition to the presence of a true effect (Cohen, 1977). The "voting method" of research synthesis has undesirable statistical properties and is likely to lead to conclusions of no effect when effects are present (Hedges & Olkin, 1980). At best, narrative reviews can reach conclusions about the existence, direction, and consistency of social facilitation effects. They cannot determine the magnitude of those effects. Manstead and Semin (1980) questioned the reliability of social facilitation, reporting five unsuccessful attempts to find an effect of audience presence. Landers, Bauer, and Feltz (1978) surmised that social facilitation effects are so small as to be of almost "trivial predictive significance," accounting for 1% to 3% of the between-subjects variance in motor performance and 2% to 5% of the between-subjects variance in verbal performance. However, Landers, Bauer, and Feltz

based these conclusions on the results of a single study. The size of most social facilitation effects is not known.

An Alternative: Meta-Analysis

Glass, McGaw, and Smith (1981) described an alternative to the narrative literature review, a quantitative approach called meta-analysis. One begins a meta-analysis by systematically searching for all potentially relevant studies. The meta-analyst next calculates a measure of effect size from each study, then uses statistical methods to summarize and make inferences from the resulting measures.

Meta-analysis avoids many of the problems of the narrative literature review. By including all relevant studies, the technique prevents a reviewer's biases from influencing the selection of studies to be reviewed (Cooper, 1982). By analyzing the size of experimental effects rather than their statistical significance, the technique avoids the low power of the voting method, ensures that conclusions will not depend on study sample sizes, and allows a combined estimate of effect size. With procedures outlined by Rosenthal (1978; after Rhine, Pratt, Stuart, Smith, & Greenwood, 1940), meta-analysis allows an overall test of the reliability of experimental effects.

In the present article, we report a quantitative review of research on human social facilitation. The review attempts to include all studies of human social facilitation written in English prior to 1982. It does not cover animal studies. The literature on animal social facilitation is large; Clayton (1978) cited 227 references in a recent narrative review. Much of this literature is not comparable to the human literature. As Tolman (1968) noted, studies of animal social facilitation routinely examine the influence of others' behaviors on the individual, whereas, studies of human social facilitation consider only the influence of others' presence.

The Present Review

Sample of Studies

A search was made for studies of human social facilitation. The following sources were consulted: *Psychological Abstracts* (1927–

1981), *Dissertation Abstracts International* (Volumes 1-41), *Science Citation Index* (1961-1968), *Social Sciences Citation Index* (1969-1981), *ERIC Resources in Education* (1956-1981), and reference lists in earlier reviews (Cottrell, 1972; Dashiell, 1935; Geen & Gange, 1977; Guerin & Innes, 1982; Landers & McCullagh, 1976; Sanders, 1981a; Zajonc, 1965, 1980). All studies that had cited key social facilitation research or had been indexed under relevant subject headings (e.g., audience, coaction, social facilitation) or had been cited in previous reviews were examined. To be included in the present sample, a study had to compare the behavior or physiology of humans who were alone to the behavior or physiology of humans who were in the presence of others. For reasons discussed by Cooper (1982), this inclusion criterion was broadly construed. Subjects were regarded as "alone" if an investigator had labeled them as such, even if an experimenter had been present to observe their performance; subjects were considered to be in "the presence of others" if they believed others could see them or were in the room with them, even if those others could not be seen. The resulting sample included 241 studies of the effect of nonactive or coacting others on humans (see the Appendix). Excluded from the sample were foreign language studies, animal studies, studies in which others verbally interacted with the subject, and studies in which the only dependent measure was a self-report.

Data Extracted From Each Study

The effects of the presence of others were noted in each study. Many studies reported more than one effect; in such cases, each effect was coded separately, up to a maximum of 12 effects from a single article. In all, the 241 studies yielded 742 effects of the presence of others.

Each effect was measured in three ways: as a standardized mean difference

$$d = \frac{(M_{\text{Others present}} - M_{\text{Alone}})}{SD}$$

(Cohen, 1977), as a percentage overlap in scores (U_3 = the percentage of alone subjects

whose scores were surpassed by the average subject who was in the presence of others; Cohen, 1977), and as a standard normal deviate (Z = that standard normal deviate corresponding to the one-tailed p value of the experimental effect; Cooper, 1979). For purposes of analysis, an effect was given a positive sign if subjects performed more quickly, more accurately, or exhibited a higher level of physiological arousal when in the presence of others than when alone. Slower performances, worse performances, and lower arousal in the presence of others were designated by negatively signed effects. Sometimes researchers report that an effect is "not significant" without providing sufficient information for computation of an effect size. In such instances, an attempt was made to ascertain the effect size by contacting the researcher. Some researchers could not be reached; some did not respond. Seventy-eight nonsignificant effects remained unexplicated. These were assigned an effect size of zero and included in the meta-analysis.

Effects of the presence of others were related to 5 procedural variables and 13 substantive variables. The procedural variables included the following:

1. *Date of study.*

2. *Publication status.* A study was classified as either published or unpublished. Doctoral dissertations were classified as unpublished studies.

3. *Number of subjects.* The total number of subjects in the study was recorded.

4. *Experimental design.* The manipulation of the presence of others was classified as either a between-subjects factor or a within-subjects factor (Myers, 1979).

5. *Control condition validity.* All studies in this review included a condition in which subjects were ostensibly alone. Depending on the validity of this "alone" condition, a study was placed into one of three categories: (a) No one was in the room with the alone subject; (b) someone was in the room with the alone subject; or (c) a reader cannot tell whether or not someone was in the room with the alone subject. These will be termed high, low, and unknown control condition validity.

The substantive variables included the following:

1. *Mean subject age.* Unless otherwise specified, we assumed that the mean age of undergraduate subjects was 19.

2. *Proportion of male subjects.* If subject sex was not specified, we assumed that half of the subjects were male.

3. *Number of others.* This is the number of others present in the experimental condition minus the number of others present in the alone condition.

4. *Proportion of male others.* If unreported, we assumed that half of the others were male.

5. *Role.* Others were classified as either coactors or audience members. The latter included anyone who was not working on a task.

6. *Observer status.* Audience members were classified as either peers or experts. The experimenter was considered an expert, as were observers represented as experts and observers much older than child subjects. All other observers were considered peers. Coactors—almost invariably the subject's peers—were excluded from analyses of status. We also excluded audience members of unknown status.

7. *Familiarity.* Depending on their preexperimental acquaintance with the subject, others were classified as either familiar or unfamiliar. Anyone not described as an acquaintance of the subject was assumed to be unfamiliar.

8. *Visibility of others.* Others were classified as either visible or not visible to the subject. Others positioned directly behind the subject were considered not visible, as were any others whose face the subject could not see.

9. *Visibility of subjects.* Subjects were classified as either visible or not visible to others. If others could not see the subject's face at the time the dependent measure was taken, the subject was considered not visible.

10. *Evaluation potential.* Others either could or could not evaluate the subject's performance. In coding evaluation potential, we ordinarily adopted researchers' judgments. Occasionally, a researcher assumes that because subjects are not informed that their performance is being evaluated, others lack evaluation potential. The codings do not make this assumption. Unless others are

clearly unable to evaluate task performance, they are presumed to have evaluation potential.

11. *Subject anxiety.* When reported, we noted the subjects' mean percentile rank on a measure of trait anxiety.

12. *Task complexity.* If a researcher described his or her experimental task as simple or described it as complex, we adopted this judgment. If the researcher offered no such description, but other researchers had used that task and had agreed on its complexity, we adopted their consensus judgment. Despite this attempt to classify all tasks as either simple or complex, there were some tasks of unknown complexity.

13. *Dependent measure.* Studies examined social effects on four types of dependent measure: physiology, performance quantity (or speed), performance quality (or accuracy), and miscellaneous dependent measures. Physiological measures included galvanic skin response (GSR), heart rate, and palmar sweating. Performance quantity measures included latency to respond, time to complete an extended behavior, and number of responses per unit time (i.e., response rate). Performance quality measures included trials to criterion and number (or proportion) of errors. The rare measure that involved both quantity and quality of performance was classified as a quantity measure.

As a reliability check, two raters independently coded the substantive variables in five randomly selected studies. The check revealed a satisfactory level of reliability; the two raters agreed in 93.3% of their codings. The inclusion of procedural variables in this check yielded a higher rate of agreement.

Characteristics of the Sample

The literature search yielded 241 studies of social facilitation: 202 published studies and 39 unpublished studies. The 202 published studies had appeared in 50 different journals and 3 books. Thirty-five of the 39 unpublished studies were master's or doctoral theses. Of the 241 studies, 205 were dated 1965 or later; the earliest was dated 1898. Seventy-nine studies examined the effect of coacting others; 162 investigated the effect of observers. A total of 23,970 subjects partic-

ipated in these studies. Thirty-seven percent of the subjects were female; 46% were male. Researchers did not report the sex of 17% of the subjects.

Markus (1978) criticized social facilitation research, noting that an experimenter is often present to observe the performance of subjects claimed to be alone. Her critique is broadly applicable: In only 100 of the 241 studies reviewed did the author state that the experimenter was in a different room from the subject when the subject was ostensibly "alone." Interestingly, a higher percentage of unpublished studies met this validity criterion than did published studies (48.7% of unpublished vs. 40.1% of published studies had high validity control conditions). However, this difference is not reliable, corrected $\chi^2(1) = .68, p > .30$. In 96 of the 241 studies, an experimenter was in the room with the "alone" subject; and in 52 of these studies, this "alone" subject could see the experimenter!

Advocates of field research fault social psychologists for their overreliance on college students as participants in research. Surveys periodically reveal that undergraduates serve as the subjects for about 70% of social psychological studies published in major journals (Higbee, Millard, & Folkman, 1982; Schultz, 1969). Consistent with these surveys, undergraduates were used as subjects in 72.3% of the published studies in the present review. Interestingly, only 51.3% of the review's unpublished studies used undergraduate subjects. This is a reliable difference, corrected $\chi^2(1) = 5.78, p < .02$.

All 241 of these studies manipulated the presence of others: 195 as a between-subjects factor, 46 as a within-subjects factor. Some of the studies manipulated other variables as well: 17 manipulated observer status; 25, evaluation potential; and 44 of the 241 studies manipulated the complexity of the subject's task.

Methods of Analysis

The results of the 241 social facilitation studies were combined to provide an aggregate description of the effects of the presence of others. Effects were grouped by dependent measure (physiology/performance quantity/

performance quality) and by the complexity of the subject's task (simple task/complex task/task of unknown complexity). Omitted from all analyses were 58 social effects on miscellaneous dependent measures.¹

Descriptive and inferential methods were applied to the remaining effects. Effect sizes were displayed in 5-number summaries (Tukey, 1977). These show the lowest effect size (min), the highest effect size (max), and effect sizes at the first, second, and third quartiles (Q_1 , Mdn , and Q_3). Six other summary measures were computed: the mean effect size ($\bar{d}$), a covariance-adjusted mean effect size ($\bar{d}'$), the mean of the absolute values of effect sizes ($|\bar{d}|$), the mean percentage of subjects in the alone condition whose scores were surpassed by the average subject in the presence of others (U_3), the unweighted Stouffer meta-analytic standard normal deviate (Z_{ma}), and the fail-safe N .

Each effect of the presence of others was weighted equally in the means reported below. Preliminary analyses had applied alternative weighting schemes: one that weighted each effect by sample size (see Rosenthal & Rubin, 1982), and a second that gave equal weight to each study (regardless of the number of effects in the study). These alternative analyses yielded mean effect sizes similar to the ones reported. Means were covariance adjusted for substantive variables 1 through 10, which were previously described.

Results from all the studies were combined to determine the unweighted Stouffer meta-analytic Z (Rosenthal, 1978). This statistic permits computation of the probability that the combined effect of the presence of others would occur by chance. Credence in a statistically reliable meta-analytic Z may be compromised by the suspicion that researchers do not report nonsignificant results (Greenwald, 1975). Rosenthal (1979) described a method for determining the num-

¹ One of the miscellaneous dependent measures was proportion of dominant responses, a measure used on pseudorecognition, hidden-word, and word-association tasks. Evidence from these tasks has been cited in support of the drive theory of social facilitation (Zajonc, 1980) and in support of a self-presentational analysis (Blank, Staff, & Shaver, 1976). Other miscellaneous dependent measures were derived from studies of nonverbal behavior and aggression.

ber of unreported null effects that would be needed to reduce a meta-analytic Z to non-significance. The larger this "fail-safe N ," the more confidence one can have in the reliability of a meta-analytic result. As a rule of thumb, Rosenthal suggested that a meta-analytic Z be regarded as resistant to the "file drawer problem" of unreported null results if the fail-safe N exceeds $5k + 10$, where k is the number of reported effects.

Task Complexity and Dependent Measure

An initial set of analyses examined the effects of the presence of others across all 241 social facilitation studies. Table 1 displays these effects at their highest level of aggregation: across three levels of task complexity and three dependent measures. According to Cohen (1977), psychologists can consider an effect size of .20 as small, an effect size of .50 as medium, and one of .80 as large. By these criteria, the effects of the presence of others are small to medium in size. The largest mean effect is a social impairment of complex performance quality ($d = -.36$). The average subject who is in the presence of others performs a complex task more accurately than 39% of subjects who are alone. Even this largest effect accounts for only 3.1% of the between-subjects variance in performance quality. The corresponding median effect of the presence of others accounts for only 1.3% of the variance. Cooper and Findley (1982) find much larger effects in social psychology textbooks, including a mean effect ($d = 1.19$) that accounts for 26.1% of the variance in an average experiment.

The effects of the presence of others are highly variable. Small mean effect sizes reflect, in part, the large number of effects directionally opposite the mean. The proportion of such directionally opposite effects ranges from 17.4% (on physiology during simple task performance) to 42.6% (on complex performance quantity). Averages of the absolute values of effect sizes indicate that the presence of others accounts for 1.5 to 11.4% of the between-subjects variance (on physiology during simple performance and the quantity of performances of unknown complexity, respectively).

Zajonc's drive theory (1965, 1980) predicts that individuals will invariably experience higher levels of arousal in the presence of others; a self-presentational analysis (Bond, 1982; Note 1) predicts such arousal only if the individual is attempting a complex task. In fact, the presence of others has not been shown to have a reliable effect on the physiology of persons performing a simple task ($d = .04$; $Z_{ma} = .89$, *ns*). This effect remains unreliable (with $Z_{ma} = 1.18$) if all unexplicated nonsignificant effects are excluded from the analysis. Social conditions can affect physiology. Consistent with the self-presentational analysis, one of the strongest effects of the presence of others is to raise the physiological arousal of subjects performing a complex task ($d = .36$; Z_{ma} = than the physiological effect during simple task performance, the effects are not reliably different (simple vs. complex physiological effect on d yields a $t[50] = 1.38$; on d' , $t[68] = 1.34$).²

Drive theory (Spence, 1956) predicts that the presence of others should increase the speed of simple task performance by enhancing the correct response. It makes no general prediction about social effects on complex performance speed. The data reveal that the presence of others causes a reliable increase in simple performance quantity ($d = .32$; $Z_{ma} = 12.57$, $p < 10^{-32}$) and a reliable reduction in complex performance quantity ($d = -.20$; $Z_{ma} = -3.91$, $p < .00005$). The latter effect is smaller than the former, and this apparent slowing of complex performances might have resulted from the selective reporting of significant results (fail-safe $N = 160$, with 54 reported effects). Significance tests indicate that the presence of others has different effects on simple, as opposed to complex, performance quantity (simple vs. complex difference on d gives $t[207] = 4.85$, $p < 10^{-6}$; on d' gives $t[245] = 3.94$, $p < .0005$).

² All significance tests reported in this article use ordinary least squares methods. Barely significant results should be interpreted with caution because the present data set does not satisfy the ordinary least squares assumption of independence. For a discussion of this issue and of the curious role of statistical inference in meta-analysis, see Glass, McGaw, and Smith (1981, pp. 197-216).

Table 1
Results of All Studies by Dependent Measure and Task Complexity

Task complexity	<i>n</i>	5-number ^a summary of <i>d</i>	$\bar{d}$	$\bar{d}'^b$	$ \bar{d} $	<i>U</i> ₃	<i>Z</i> _{ma} ^c	Fail-safe <i>N</i>
Physiology								
Simple	23		.04	.03	.25	52	.89	—
<i>Mdn</i>		.00						
Q1/Q3		.00/.44						
min/max		-1.75/.92						
Complex	29		.36	.32	.70	58	5.66	213
<i>Mdn</i>		.00						
Q1/Q3		.00/.74						
min/max		-1.37/2.39						
Unknown	30		.06	.10	.39	52	1.16	—
<i>Mdn</i>		.00						
Q1/Q3		-.22/.54						
min/max		-1.24/1.38						
Quantity								
Simple	154		.32	.29	.51	60	12.57	6,183
<i>Mdn</i>		.21						
Q1/Q3		-.05/.66						
min/max		-1.03/2.82						
Complex	54		-.20	-.18	.50	44	-3.91	160
<i>Mdn</i>		-.02						
Q1/Q3		-.58/.16						
min/max		-2.22/1.48						
Unknown	51		.21	.26	.72	57	3.76	137
<i>Mdn</i>		.19						
Q1/Q3		-.24/1.02						
min/max		-2.39/1.90						
Quality								
Simple	112		.11	.12	.44	54	3.24	194
<i>Mdn</i>		.03						
Q1/Q3		-.18/.41						
min/max		-1.73/2.01						
Complex	147		-.36	-.36	.56	39	-12.36	5,697
<i>Mdn</i>		-.23						
Q1/Q3		-.75/.02						
min/max		-3.24/1.71						
Unknown	84		-.25	-.22	.70	45	-5.94	687
<i>Mdn</i>		-.06						
Q1/Q3		-.65/.25						
min/max		-3.70/2.26						

Note. *n* = number of effects; $\bar{d}$ = mean effect size; $\bar{d}'$ = covariance-adjusted mean effect size; $|\bar{d}|$ = mean absolute effect size; *U*₃ = percentage of alone subjects whose performance or arousal level was surpassed by the average subject who was in the presence of others; *Z*_{ma} = the unweighted Stouffer meta-analytic *Z*, a test statistic that follows the standard normal distribution.

^a The 5-number summary of *d* shows the lowest effect size (min), the highest effect size (max), and the effect sizes at first (Q₁), second (*Mdn*), and third (Q₃) quartiles. A positive *d* indicates that subjects were more aroused, worked more quickly, or worked more accurately in the presence of others than when alone.

^b Means were covariance adjusted for the substantive variables 1 through 10 listed in the text. In this table, the adjustments were made within dependent measure. In subsequent tables, adjustments were made within dependent measure and task complexity; there, multicollinearity prevented adjustment of physiological means.

^c A *Z*_{ma} of 1.96 is required for two-tailed significance at the .05 level. The fail-safe *N* is the number of null effects needed to lower a significant *Z*_{ma} to 1.96.

On quantitative tasks like reel turning (Triplett, 1898), researchers monitor only a single response, a response that is executed with greater or lesser speed. On qualitative tasks like verbal learning (Pessin, 1933), they monitor several responses: a correct response and at least one incorrect response. According to drive theory (Zajonc, 1965, p. 270; following Hull-Spence logic, Spence, 1956, pp. 221-236), the presence of others should enhance the dominant response to a qualitative task, increasing the probability of the correct response if the task is simple and the probability of an incorrect response if the task is complex. Nondrive theories (Bond, 1982; Carver & Scheier, 1981) also predict that simple performance accuracy will be socially facilitated and complex performance accuracy socially impaired.

Combining results from all studies, it appears that these theories are half right. The presence of others does impair complex performance quality ($d = -.36$; $p < 10^{-33}$ for the Z_{ma}), and the social effects on performance quality do depend on task complexity (simple vs. complex difference yields a $t[257] = 5.46$ on d , a $t[329] = 4.99$ on d' , each $p < 10^{-6}$). Indeed, task complexity accounts for 14.6% of the task-to-task variance in effect sizes. What can be questioned is the hypothesized social facilitation of simple performance quality. This facilitatory effect appears reliable ($d = .11$, $p < .005$ for the Z_{ma}), but nearly 40% of the reported effects of the presence of others on simple performance quality are negative in direction. The apparent facilitation might result from a selective reporting of theory-predicted results: Adding 194 unreported null effects to the 112 results reported would reduce this social facilitation to nonsignificance. Exclusion of unexplicated nonsignificant results raises the mean effect size only slightly, from .11 to .12. Reliable or not, the facilitatory mean effect is quite small; on the average, it accounts for only .30% of the performance variance between subjects. The mean effect implies that the average subject in the presence of others performs a simple task less accurately than 46% of the subjects who are alone. The social facilitation of simple performance quality is less than one-third the magnitude of the corresponding impairment of complex perfor-

mance quality, and this difference in magnitude is itself reliable: on d the difference between .36 and .11 would yield a $t(257) = 2.88$, $p < .005$; on d' the difference between .36 and .12 would yield a $t(329) = 2.47$, $p < .01$. Hence both the direction and magnitude of social effects on performance quality depend on task complexity.

Critics may dispute the sample of studies on which a meta-analysis is based. Rachman and Wilson (1980) criticized a meta-analysis of psychotherapy outcomes for including unpublished studies because such studies are not widely accessible. These writers criticize a meta-analysis for including poorly controlled studies, citing the adage of computer enthusiasts "Garbage in—garbage out." To allay such skepticism, we summarize in Table 2 the results of selected studies: published and unpublished studies; and studies of high, low, and unknown control condition validity. A perusal of the table reveals that no major conclusions of this meta-analysis would be altered by excluding unpublished studies or studies of dubious validity. Considering only research with high control condition validity, the presence of others heightens physiological arousal only when subjects are performing complex tasks; it impairs complex performance quantity and quality; and it facilitates simple performance quantity. In these best-controlled studies, as in all studies combined, the presence of others has a very small facilitatory effect on simple performance quality, an effect that is vulnerable to cancellation by unreported null results; fail-safe N for highly valid studies is 116. Published studies exhibit this same pattern of results, with a fail-safe N on simple quality of 133. Publication status does appear related to effect sizes. In unpublished studies, there is no reliable social facilitation of simple performance quality ($Z_{ma} = .99$). In five of six comparisons (across dependent measure and task complexity), mean effect sizes are smaller in unpublished than in published research. In the sixth comparison (on physiology during simple performance), the effect in unpublished research is in an unexpected direction.

Critics charge that meta-analysis compares "apples and oranges" by aggregating conceptually distinct dependent measures (Rach-

Table 2
Results of Selected Studies

Dependent measure	Simple task				Complex task			
	<i>n</i>	$\bar{d}$	$\bar{d}'$	Z_{ma}	<i>n</i>	$\bar{d}$	$\bar{d}'$	Z_{ma}
Published studies								
Physiology	18	.10		1.19	28	.37		5.76
Quantity	118	.36	.33	11.78	35	-.37	-.36	-6.51
Quality	79	.14	.11	3.21	111	-.41	-.41	-12.25
Unpublished studies								
Physiology	5	-.16		-.35	1	.00		.00
Quantity	36	.18	.27	4.68	19	.11	.09	2.25
Quality	33	.04	.10	.99	36	-.19	-.18	-3.45
Studies with high control condition validity								
Physiology	7	-.12		-.34	12	.20		1.60
Quantity	59	.40	.39	9.15	28	-.26	-.21	-3.98
Quality	51	.18	.03	3.55	53	-.47	-.47	-8.95
Studies with low control condition validity								
Physiology	14	.13		1.38	15	.53		6.44
Quantity	70	.20	.25	5.56	23	-.19	-.27	-2.02
Quality	47	.07	.19	1.54	77	-.27	-.26	-7.24
Studies with unknown control condition validity								
Physiology	2	.00		.00	2	.00		.00
Quantity	25	.43	.31	7.84	3	.20	.36	1.19
Quality	14	.00	.08	-.43	17	-.41	-.45	-5.12

Note. *n* = number of effects; $\bar{d}$ = mean effect size; $\bar{d}'$ = covariance-adjusted mean effect size; Z_{ma} = the unweighted Stauffer meta-analytic *Z*.

man & Wilson, 1980). Moore and Baron (in press) made distinctions among several measures of physiological activity in discussing the effects of the presence of others. Weiss and Miller (1971) distinguished response rate (in a free operant paradigm) from response latency or completion time (in a discrete trials paradigm), noting that Hull-Spence theory considered the former to be outside its domain. Table 3 displays social effects on nine specific dependent measures: three physiological measures, three measures of performance quantity, and three measures of performance quality.

An analysis of variance (ANOVA) indicates that the presence of others does not differentially affect the three physiological measures. Yet only palmar sweating is reliably affected by the presence of others. The presence of

others increases sweating among subjects who are performing a complex task ($\bar{d} = .90$; $Z_{ma} = 7.39$, fail-safe $N = 106$) and among subjects who are performing a simple task ($\bar{d} = .24$, $Z_{ma} = 2.34$), though the latter effect is vulnerable to unreported null results (fail-safe $N = 6$). A statistical analysis reveals differences in unadjusted social effects on the three quantitative measures, $F(2, 202) = 3.66$, $p = .027$, as well as an interaction of the three measures with task complexity, $F(2, 202) = 3.73$, $p = .026$. The interaction indicates that on complex tasks the presence of others slows completion time more than latency or response rate ($p < .025$ for a comparison of the $\bar{d}$ s), whereas on simple tasks the presence of others tends to accelerate completion time more than latency or rate ($p < .10$). These differential quantitative effects are probably due to un-

Table 3
Disaggregated Dependent Measures in Simple and Complex Tasks

Dependent measure	Simple task				Complex task			
	<i>n</i>	$\bar{d}$	$\bar{d}'$	Z_{ma}	<i>n</i>	$\bar{d}$	$\bar{d}'$	Z_{ma}
Physiology								
GSR	5	-.35		-.94	11	.22		1.67
Heartrate	8	.04		-.50	10	.07		1.28
Palmar sweat	10	.24		2.46	8	.90		7.39
Quantity								
Latency	33	.05	.17	1.35	12	-.36	-.44	-3.23
Completion time	21	.54	.46	8.02	9	-.64	-.41	-5.18
Response rate	100	.36	.31	11.15	33	-.03	-.06	-.34
Quality								
Errors	87	.15	.12	3.49	104	-.40	-.38	-11.65
Trials to criterion	9	-.26	-.41	-2.09	19	-.22	-.20	-2.16
Other	16	.13	.33	2.00	24	-.31	-.37	-4.40

Note. GSR = galvanic skin response; *n* = number of effects; $\bar{d}$ = mean effect size; $\bar{d}'$ = covariance-adjusted mean effect size; Z_{ma} = the unweighted Stouffer meta-analytic *Z*.

controlled variables. Analyses on covariance-adjusted means reveal no differences whatsoever (each completion time vs. latency/rate $p > .20$). The presence of others does not differentially affect the three measures of performance quality. In all, Table 3 gives little empirical justification for distinguishing among different physiological, quantitative, and qualitative measures in analyses of social facilitation.³

Skeptics question meta-analytic results by citing potentially relevant variables that have not been controlled. To anticipate their doubts, experiments were examined that controlled for the effects of all variables except for the presence of others and a second variable of interest. Forty-four studies experimentally manipulated the complexity of tasks subjects performed either alone or before others. This permits a within-study analysis of the role of task complexity in social facilitation, an analysis that appears in the upper half of Table 4. In 18 studies, an investigator measured a given subject's performance for both quantity and quality, allowing the within-study quantity/quality analysis that is displayed in the lower half of Table 4. An inspection of the table reveals results that are now familiar. When subjects perform a simple task, their physiology is not much affected by the presence of others; when they attempt a complex version of the same task, their physiology is more affected. The presence of

others accelerates performance of a simple task while leaving quality in performance on that same task unaffected. Performance quality is inferior in the presence of others on complex tasks. On simple versions of the same tasks, there is a minor social facilitation: less than one-seventh of the complex quality impairment. This difference in magnitude is again statistically reliable. After reversing the sign of the complex quality mean, it still differs from the simple quality mean: mean = .54 versus .07, $t(127) = 3.70$, $p < .0005$. Correlations across studies that measure both quantity and quality reveal that the effect of the presence of others on simple performance quantity is unrelated to its effect on simple performance quality ($r = .02$, *ns*). There is a positive (if nonreliable) correlation between social effects on complex performance quantity and quality ($r = .45$, $p = .104$).

Many factors besides task complexity and dependent measure might influence social facilitation effects. Yet meta-analysts Hunter, Schmidt, and Jackson (1982) advised against a routine search for such variables, observing

³ Analyses similar to those in Tables 6-8 reveal that the three physiological measures, the three quantitative measures, and the three qualitative measures are not differentially affected by role, observer status, familiarity, visibility of others, visibility of subjects, or evaluation potential.

that all differences among effect sizes may be artifactual and may result solely from sampling error. The meta-analysts present methods for analyzing the variation in effect sizes and for separating variation due to sampling error from variation due to other factors (Hunter, Schmidt, & Jackson, 1982, p. 102).

Table 5 displays results from Hunter, Schmidt, and Jackson's (1982) analysis of artifactual and nonartifactual variation. There is considerable nonartifactual variation in the effects of the presence of others, even when variation is computed within task complexity and dependent measure. True, sampling error accounts for nearly 91% of the already small variation in effects on physiology during simple task performance, but it accounts for less than 25% of variation in each of the other tabulated effects. And (with the single exception of physiology during simple performance) nonartifactual standard deviations in effect size are large, relative to the mean effect sizes of Table 1. Results from this analysis motivate a search for moderator variables.

Evaluation Potential and Observer Status

Zajonc (1980) argued that the mere presence of nonevaluative others will increase a performer's level of drive. Cottrell (1972) replied that mere presence is not sufficient: Only others who can evaluate performance

Table 5

Artifactual and Nonartifactual Variance in Effect Sizes by Task Complexity and Dependent Measure

Dependent measure	Observed variance (σ_d^2)	Variance due to sampling error (σ_e^2)	Variance corrected for sampling error (σ_e^2)
Physiology			
Simple	.077	.070	.007
Complex	.713	.066	.647
Quantity			
Simple	.307	.056	.251
Complex	.384	.077	.307
Quality			
Simple	.301	.075	.226
Complex	.486	.079	.407

will raise the performer's drive level. Table 6 displays results pertinent to this controversy, depicting the impact of evaluation on social facilitation—its impact across all studies (the upper half of the table) and in the 25 studies that experimentally manipulated evaluation potential (the lower half of the table).

Table 6 shows that others can affect an individual's performance by their mere presence. Both across and within studies, the presence of nonevaluative others significantly increases simple performance quantity, reduces complex performance quantity, and impairs complex performance quality (considering all studies, least significant is the mere presence effect on complex quantity, $Z_{ma} = -3.95$, $p < 10^{-4}$, fail-safe $N = 33$). According to Zajonc, mere presence produces these behavioral effects by increasing drive. However, a simple performer's physiology is unaffected by the mere presence of others, and their mere presence may reduce the physiological arousal of the individual who attempts a complex task (in the 5 reported effects, for complex physiology, $Z_{ma} = -3.36$, $p < .0005$; though the fail-safe N is only 10).

Cottrell's (1972) account of social facilitation implies that a performer's drive level should be increased more by the presence of evaluative than nonevaluative others. Some physiological evidence is consistent with this view: In all studies, evaluative others raise a

Table 4

The Role of Complexity and Performance Measure Within Studies

Dependent measure	Simple task		Complex task	
	<i>n</i>	$\bar{d}$	<i>n</i>	$\bar{d}$
Studies that manipulate task complexity				
Physiology	8	.04	8	.49
Quantity	33	.31	32	-.19
Quality	63	.07	66	-.54
Studies that measure both quantity and quality				
Physiology				
Quantity	31	.21	14	.02
Quality	31	-.03	14	-.28

Note. *n* = number of effects; $\bar{d}$ = mean effect size.

Table 6
The Role of Evaluation Potential Across and Within Studies

Dependent measure	Simple task				Complex task			
	<i>n</i>	$\bar{d}$	$\bar{d}'$	Z_{ma}	<i>n</i>	$\bar{d}$	$\bar{d}'$	Z_{ma}
Across all studies								
Physiology								
Evaluation potential	17	.05		1.01	24	.55		7.76
No evaluation potential	6	.00		.04	5	-.55		-3.36
Quantity								
Evaluation potential	121	.32	.35	11.59	43	-.12	-.12	-2.38
No evaluation potential	33	.31	.18	4.96	11	-.52	-.53	-3.95
Quality								
Evaluation potential	87	.10	.07	2.87	112	-.37	-.34	-11.12
No evaluation potential	25	.15	.25	1.50	35	-.32	-.42	-5.43
Within studies that manipulate evaluation potential								
Physiology								
Evaluation potential	4	.00		.01	1	.00		.00
No evaluation potential	3	.01		.06	1	.00		.00
Quantity								
Evaluation potential	13	.52		5.13	7	-.18		-1.11
No evaluation potential	13	.28		2.37	7	-.36		-2.20
Quality								
Evaluation potential	7	.52		3.43	13	-.75		-7.59
No evaluation potential	7	.42		2.49	13	-.34		-3.49

Note. *n* = number of effects; $\bar{d}$ = mean effect size; $\bar{d}'$ = covariance-adjusted mean effect size; Z_{ma} = the unweighted Stouffer meta-analytic *Z*.

complex performer's level of arousal, whereas nonevaluative others lower it (evaluation potential vs. no evaluation potential, $p < .05$). However, evaluation potential does not significantly magnify social effects on performance quantity, performance quality, or physiology during simple task performance (the largest effect in all studies is on complex quantity, where evaluation potential moderates social impairment, $t[52] = 1.65$, $p = .10$). Directional differences do not support Cottrell's learned drive analysis: Both across and within studies, evaluation potential seems to reduce the mean effect of the presence of others nearly as often as it magnifies that effect. Mean effect sizes in published studies and in highly valid studies are identically patterned to those in all studies. Both published and highly valid studies display reliable mere presence effects.

Cottrell assumed that the performer will have learned to experience more evaluation apprehension in the presence of experts than peers, hence experts should more strongly in-

crease drive. Table 7 displays pertinent results across all studies and within the 17 studies that manipulated observer status. Relative to peers, the expert observers in all studies do cause more facilitation of simple performance quality, $t(100) = 2.38$, $p < .025$ on $\bar{d}'$. Indeed, expert presence clearly benefits simple performance quality ($Z_{ma} = 6.84$, $p < 10^{-11}$, Fail-safe $N = 425$), whereas peer presence has no effect ($Z_{ma} = .02$). Yet contrary to the learned drive account, only peer (not expert) presence reliably increases simple performance quantity (considering all studies, peer effect yields $Z_{ma} = 7.93$, $p < 10^{-13}$; expert effect, $Z_{ma} = 1.26$, *ns*; peer vs. expert difference on mean $\bar{d}$ yields $t[62] = 2.48$, $p < .02$). Observer status does not influence social effects on complex performances (though only peer presence reliably reduces complex quantity), nor does observer status significantly moderate the physiological consequences of the presence of others (though only expert presence increases a complex performer's arousal). On the whole, this analysis of observer status does little to encourage Cot-

Table 7
The Role of Observer Status Across and Within Studies

Dependent measure	Simple task				Complex task			
	<i>n</i>	$\bar{d}$	$\bar{d}'$	Z_{ma}	<i>n</i>	$\bar{d}$	$\bar{d}'$	Z_{ma}
Across all studies								
Physiology								
Expert	11	.10		1.60	18	.73		9.05
Peer	7	.02		.08	2	-.17		-1.05
Quantity								
Expert	38	.07	.12	1.26	18	-.09	.08	-1.09
Peer	26	.46	.55	7.93	8	-.62	-.61	-4.45
Quality								
Expert	38	.35	.29	6.84	56	-.37	-.32	-7.75
Peer	20	.03	-.14	.02	29	-.37	-.42	-6.08
Within studies that manipulate status								
Physiology								
Expert	4	.15		.40	0			
Peer	3	.11		.92	0			
Quantity								
Expert	5	.19		2.58	1	-.38		-1.70
Peer	5	.88		6.48	1	-.74		-3.29
Quality								
Expert	5	-.18		-2.06	8	-.57		-4.28
Peer	6	-.10		-1.00	8	-.11		-.70

Note. *n* = number of effects; $\bar{d}$ = mean effect size; $\bar{d}'$ = covariance-adjusted mean effect size; Z_{ma} = the unweighted Stouffer meta-analytic *Z*.

trell's learned drive account. His account is no more encouraged by analyses that exclude unpublished studies and studies of dubious control condition validity.

Other Variables

From their social monitoring theory, Guerin and Innes (1982) predicted that a performer will exhibit heightened drive only in the presence of unpredictable, unfamiliar, or imperceptible others. Table 8 displays results relevant to this theory, documenting the impact of the visibility of subjects and the role, familiarity, and visibility of others on social facilitation.

Guerin and Innes presumed that audience members are less predictable than coactors; hence audience presence should generate more drive. In the research to date, audience presence heightens a complex performer's arousal more than coactor presence, and audience presence causes the greater facilitation of sim-

ple performance quality (each difference in $\bar{d}$ yields $p < .025$). Role does not, however, influence social effects on complex performance nor social effects on physiology during simple performance. Contrary to the social monitoring prediction, simple performance quantity is only half as facilitated by audience as by coactor presence: $\bar{d} = .20$ versus $.40$; $t(152) = -1.81$, $p = .07$.

According to the social monitoring theory, performers should experience heightened drive in the presence of unfamiliar but not familiar others. This prediction is supported by one result: Unfamiliar others increase a complex performer's arousal, whereas familiar others do not (familiar vs. unfamiliar difference in $\bar{d}$ yields a $p < .05$). The presence of familiar others may actually reduce a complex performer's arousal ($Z_{ma} = -4.06$, $p < .00005$, though the fail-safe *N* is only 16), a result which corroborates speculations about the calming influence of affiliation (Schachter, 1959). Familiarity does not moderate social effects on

performance quantity, performance quality, or physiology during a simple performance. Disregarding statistical significance, familiar others have smaller effects than unfamiliar others in all six of the comparisons in Table 8 (across task complexity and dependent measure).

Guerin and Innes predicted that the pres-

ence of nonvisible others will increase a performer's level of drive and that the presence of visible others will not. Physiological arousal may be increased more by the presence of nonvisible than visible others, though this difference does not reach statistical significance ($p > .20$ for both simple and complex tasks).

Table 8
Results of All Studies by Four Independent Variables

Independent variable	Simple task				Complex task			
	<i>n</i>	$\bar{d}$	$\bar{d}'$	Z_{ma}	<i>n</i>	$\bar{d}$	$\bar{d}'$	Z_{ma}
Physiology								
Role								
Coactor	5	-.06		-.56	8	-.41		-3.48
Audience	18	.07		1.30	21	.65		8.80
Familiarity								
Unfamiliar	20	.08		1.91	24	.55		8.08
Familiar	3	-.21		-1.59	5	-.55		-4.06
Visibility of others								
Not visible	5	.18		1.43	9	.65		5.49
Visible	18	.00		.25	20	.23		3.14
Visibility of subjects								
Not visible	2	.01		.07	1	.72		3.42
Visible	21	.04		.91	28	.34		5.12
Quantity								
Role								
Coactor	83	.40	.47	11.92	23	-.08	.01	-.62
Audience	71	.20	.13	5.62	31	-.30	-.36	-4.62
Familiarity								
Unfamiliar	124	.33	.15	11.40	41	-.27	-.30	-5.05
Familiar	30	.24	.36	5.30	13	.00	.11	1.02
Visibility of others								
Not visible	16	-.01	.06	-.53	12	-.06	-.09	-.58
Visible	138	.35	.34	13.46	42	-.25	-.24	-4.12
Visibility of subjects								
Not visible	11	.42	.66	3.76	4	-.48	-.27	-2.19
Visible	143	.31	.29	12.01	50	-.18	-.20	-3.44
Quality								
Role								
Coactor	41	-.07	-.05	-1.64	39	-.23	-.16	-4.47
Audience	71	.21	.20	5.31	108	-.40	-.43	-11.73
Familiarity								
Unfamiliar	92	.16	.10	4.67	120	-.40	-.41	-12.27
Familiar	20	-.11	.16	-2.34	27	-.16	-.13	-2.97
Visibility of others								
Not visible	17	.19	-.15	3.07	23	-.34	-.19	-4.54
Visible	95	.10	.16	2.22	124	-.36	-.39	-11.50
Visibility of subjects								
Not visible	6	.35	.26	2.09	6	-.45	-.44	-3.81
Visible	106	.10	.10	2.83	141	-.35	-.35	-11.83

Note. *n* = number of effects; $\bar{d}$ = mean effect size; $\bar{d}'$ = covariance adjusted mean effect sizes; Z_{ma} = the unweighted Stouffer meta-analytic *Z*.

The visibility of others clearly does not moderate social effects on complex performance or on simple performance quality. Contradicting the social monitoring prediction, non-visible others have a slightly smaller effect than visible others on simple performance quantity ($d = -.01$ vs. $.35$ for nonvisible vs. visible others), $t(152) = 2.12$, $p < .05$, though this difference is reduced to nonsignificance by a covariance adjustment of means, $t(142) = 1.38$. The visibility of subjects has no reliable influence on the effects of the presence of others.

Also of interest were the relationships of social facilitation effects to seven quantitative variables: date of study, number of subjects, subject age, proportion of male subjects,

number of others, proportion of male others, and subject anxiety. Table 9 displays pertinent correlation coefficients, which we computed across the full sample of studies. None of the relationships displayed in this table are large: Independent variables account for at most 14% of the study-to-study variance in effect sizes. Social facilitation effects appear completely unrelated to study date and to the number of subjects in the study. The presence of others has a more facilitatory effect on simple performance quality the older the subject. On simple performance quantity, females are slightly more facilitated than males by the presence of others. The number of others present has no reliable effects on task performance, and only subjects who are per-

Table 9

Correlations of Effect Size (d) With Seven Quantitative Variables

Quantitative variable	Simple task			Complex task		
	<i>n</i>	Simple <i>r</i>	Partial ^a <i>r</i>	<i>n</i>	Simple <i>r</i>	Partial <i>r</i>
Physiology						
Date of study	23	-.09		29	.21	
Number of subjects	23	.14		29	-.22	
Subject age	23	.20		29	.19	
% male subjects	23	-.11		29	-.24	
Number of others	23	.28		29	.38*	
% male others	23	.16		29	-.20	
Subject anxiety	2			8	.23	
Quantity						
Date of study	154	-.07	-.02	54	.03	.01
Number of subjects	154	-.07	-.16	54	.05	.13
Subject age	154	-.16	-.09	53	.13	.03
% male subjects	154	-.13	-.21*	54	.11	-.01
Number of others	154	.03	-.01	54	-.06	.02
% male others	154	.08	.19	54	.14	.06
Subject anxiety	6	-.67		4	-.42	
Quality						
Date of study	112	.16	.13	147	-.13	-.13
Number of subjects	112	-.12	-.10	147	.06	.05
Subject age	112	.21*	.21*	147	-.07	-.11
% male subjects	112	-.18	-.15	147	.10	.03
Number of others	112	-.10	-.06	147	-.01	-.05
% male others	112	-.16	-.07	147	.16	.12
Subject anxiety	9	-.02		24	-.03	

Note. *n* = number of effects.

^a Correlations were partialled for substantive variables 1 through 10, as noted in the text. Multicollinearity prevented the partialling of correlations with physiological effects and with subject anxiety.

* $p < .05$.

forming complex tasks experience higher levels of arousal the greater the number of others present. Small sample size impedes meta-analytic inferences about the role of subject anxiety in social facilitation. However, anxiety seems more related to social effects on performance quantity than on performance quality.

Discussion

Narrative reviews were correct in concluding that the presence of others impairs one's performance of a complex task. Such tasks are performed less accurately, and they seem to be performed more slowly when others are present. What narrative reviews could not note is the small size of these effects: On the average, the impairment from the presence of others accounts for only 1–3% of the variance in subjects' performances. Social effects on complex performances are highly variable: There is a strong social impairment of some complex performances, a social facilitation of others. On the average, the social impairment of complex performance speed is smaller than the impairment of accuracy.

Narrative reviews also concluded that the presence of others facilitates one's performance of a simple task. This conclusion is partially valid: Subjects do perform simple tasks more quickly when others are present. However, the presence of others barely affects the accuracy of simple task performance. In fact, after 112 reported attempts to document a social facilitation of simple performance accuracy, a reader wary of unreported results may wonder whether such a facilitation exists. On the average, the presence of others accounts for only .30% of the variance in simple performance accuracy. This effect is less than one-third the size of the social facilitation of simple performance speed and less than one-third the size of the social impairment of complex performance accuracy. Narrative reviews overlooked these differences in effect size.

Having found no social facilitation of simple performance, researchers sometimes conclude that a performance ceiling has obscured the social effect. As an account for a single noneffect, this explanation may be valid—in, for example, studies of simple ver-

bal learning where subjects who are alone give 90% correct responses (Bond, 1982). However, the notion of a performance ceiling would have difficulty explaining the results of all research. The explanation would be plausible if most researchers had found the presence of others to have small facilitatory effects, but they did not. Though the averaged effect of the presence of others is a slight facilitation of simple performance accuracy, a number of researchers found moderate-to-large social facilitations, and other researchers found moderate-to-large social impairments. In their wide variability, social effects on the accuracy of simple task performance do not appear to be minor fluctuations around some ceiling-imposed limit.

One might seek to explain this variability by suggesting that some accuracy tasks described as simple in this meta-analysis are, in fact, complex. The descriptions of task complexity adopted here are those offered by researchers. Post hoc reversals of researcher description might succeed in fitting observed results to theoretical expectation, but such reversals threaten to make hypotheses about social facilitation untestable tautologies. Moreover, post hoc contentions about task complexity cannot explain the asymmetry of social effects on tasks measured for both speed and accuracy. If many of the tasks that researchers judged to be simple are, in fact, complex, why does the presence of others increase subjects' speed in performing those very tasks? The asymmetry of social effects within tasks suggests that speed and accuracy are not interchangeable measures of performance.

Because they cannot be easily dismissed, differences in the size of social facilitation effects pose a challenge to prevailing theories. According to drive theory (Zajonc, 1965), the presence of others energizes a performer's dominant response tendency. Traditional behavior theory (Hull, 1943; Spence, 1956) states that this energization should affect both response probability and response latency. The theory provides no basis for predicting different effects of drive on performance quantity and quality. A self-awareness account (Carver & Scheier, 1981) suggests that the presence of others initiates a negative feedback loop that should improve performance on simple tasks. Yet, like drive theory,

this account makes no differential predictions about social effects on performance accuracy and speed. Self-presentational analyses (cf. Bond, 1982) attribute the social facilitation of performance to the performer's active regulation of a public self-image. But these analyses provide no basis for assuming that the image would be any less served by improvements in performance accuracy than by increases in performance speed. Early writers had distinguished between performance quantity and quality in discussing social facilitation (Blank, Note 2). Theorists would do well to resurrect this classic distinction, while retaining Zajonc's more recent distinction between social effects on simple and complex tasks.

Many narrative reviews concluded that the presence of others can increase an individual's level of physiological arousal. They failed to note that this effect depends on what the individual is doing. Meta-analytic results reveal that only individuals who are attempting complex tasks experience heightened arousal in the presence of others. This effect on physiology is small, accounting on the average for 3.1% of the variance in arousal levels. Palmar sweating, rather than GSR or heartrate, is the physiological index affected by the presence of others.

Students of social facilitation debate the theoretical significance of physiological measures. Zajonc (1980) treated arousal as synonymous with drive. Given this equation, meta-analytic evidence implies that the individual who is performing a simple task evinces no more drive in the presence of others. Yet for some reason that individual performs more quickly. Sanders (1981b) interpreted drive as a hypothetical construct, an entity that cannot be directly measured. In this characterization, the drive theory of social facilitation could not explain any physiological reaction to the presence of others. For some reason, however, those who perform a complex task before others exhibit heightened arousal. Carver and Scheier (1981) contended that palmar sweating reflects an individual's readiness to interact with the environment, not the individual's arousal. But they predicted no less readiness to interact with the environment on simple than on complex tasks. Bond (Note 1) characterized arousal as a correlate of the embarrassment

experienced when one perceives failure in public. From his self-presentational analysis, such failure is perceived only when the individual is attempting a task beyond his or her abilities (i.e., a complex task).

Theorists also dispute the role of evaluation apprehension in producing social facilitation effects. Zajonc (1980) maintained that the mere presence of others suffices to influence an individual's physiology and performance; Cottrell (1972) contended that the individual will be affected only if the presence of others raises apprehensions over performance evaluation. Results from this meta-analysis favor Zajonc's mere presence position: Others who lack the potential to evaluate task performance have reliable effects on physiological arousal, performance speed, and performance accuracy. Humans may invariably feel a "conditioned" evaluation apprehension when performing in front of others (Moore & Baron, in press), though this apprehension may be difficult to distinguish from a socially induced alertness (Zajonc, 1980).

In a recent narrative review, Geen (1980) wrote that "Not even the most dedicated proponent of any of the alternative theories . . . would deny that evaluation apprehension can often be a powerful cause of social facilitation in human beings" (p. 75). What the proponent would not deny, the accumulated evidence may. Others who have the power to evaluate task performance should arouse more apprehension than others who lack evaluation potential, but (when all the evidence is examined) they have no greater effect on an individual's task performance or physiology. Expert audiences should arouse more apprehension than peer audiences. Experts may have greater effects on physiology and performance accuracy than do peers. Peers, though, have the larger effect of performance speed. Despite proponents' contentions, evaluation apprehension does not reliably sum with the presence of others to determine the size of social effects.

Sanders, Baron, and Moore (1978) maintained that a conflict between attention to one's task and attention to others generates drive. According to their distraction-conflict theory, the lower the attentional demands of a task, the less conflict the presence of others should create (Moore & Baron, in press).

Assuming that simple tasks demand minimal attention, the theory may help explain why the presence of others has so little effect on accuracy and physiology in simple task performance though it might have difficulty accounting for the larger social effects on simple performance speed. Geen (1981) supposed that others must be perceptible to be distracting. Meta-analytic results indicate that—consistent with social monitoring theory (Guerin & Innes, 1982)—others who are imperceptible reliably affect performance accuracy. They may, in fact, have a greater physiological impact on the performer than do others who can be seen. Distraction-conflict theory might explain this evidence if it could demonstrate that, in the presence of an unseen audience, individuals experience an internal distraction—a rumination, for instance, over unknown audience reactions (Baron, Note 3).

Conclusions

Earlier reviews drew some misleading conclusions from the social facilitation literature. They did so by excluding large portions of the literature from consideration and by combining evidence in nonsystematic ways. Future reviewers would be well-advised to consider all the effects of the presence of others. They should not dismiss unpublished research as invalid on a priori grounds: In fact, unpublished studies sample broader subject populations and have better control conditions than many published experiments. Reviewers should be sensitive to the limitations of the “voting method” of research integration (Hedges & Olkin, 1980) and the greater limitations of purely narrative techniques (Glass, McGaw, & Smith, 1981).

Theories were constructed to explain effects of the presence of others that, on quantitative scrutiny, may not be reliable. These theories must be revised to explain why the presence of others has so little effect on an individual's accuracy in performing simple tasks. They should seek to explain why social effects on simple performance speed and on complex performance accuracy are larger, while acknowledging that even these larger effects account for little performance variance.

To accommodate existing evidence, a theory of human social facilitation must ac-

knowledge that an individual can be affected by the presence of others even when the others are not visible and even when the others lack evaluation potential. Perhaps Zajonc (1980) was correct in suggesting that the presence of others creates uncertainty and arouses an individual's alertness for the unexpected. However, this alertness may not have all the behavioral effects of generalized drive.

Recounting the history of social psychology, Gordon Allport (1954) wrote “The first experimental problem—and indeed the only problem for the first three decades of experimental research—was formulated as follows: What change in an individual's normal solitary performance occurs when other people are present?” (p. 46).

The first experimental problem of social psychology has at last received a quantitative solution.

Reference Notes

1. Bond, C. F., Jr. *A “drive” in others' presence: Specific, relevant, self-presentational*. Unpublished manuscript, Duke University, 1978.
2. Blank, T. O. *Eighty years of social facilitation: Arousal, attention, and filtering*. Unpublished manuscript, University of Missouri, 1979.
3. Baron, R. S. Personal communication, November 30, 1982.

References

- Allport, G. W. The historical background of modern social psychology. In G. Lindzey (Ed.), *The handbook of social psychology* (Vol. 1). Reading, Mass.: Addison-Wesley, 1954.
- Blank, T. O., Staff, I., & Shaver, P. Social facilitation of word associations: Further questions. *Journal of Personality and Social Psychology*, 1976, 34, 725-733.
- Bond, C. F., Jr. Social facilitation: A self-presentational view. *Journal of Personality and Social Psychology*, 1982, 42, 1042-1050.
- Burnham, W. H. The group as a stimulus to mental activity. *Science*, 1910, 31, 761-767.
- Carver, C. S., & Scheier, M. F. The self-attention-induced feedback loop and social facilitation. *Journal of Experimental Social Psychology*, 1981, 17, 545-568.
- Clayton, D. A. Socially facilitated behavior. *The Quarterly Review of Biology*, 1978, 53, 373-392.
- Cohen, J. *Statistical power analysis for the behavioral sciences* (Rev. ed.). New York: Academic Press, 1977.
- Cooper, H. M. Statistically combining independent studies: A meta-analysis of sex differences in conformity research. *Journal of Personality and Social Psychology*, 1979, 37, 131-146.
- Cooper, H. M. Scientific guidelines for conducting integrative research reviews. *Review of Educational Research*, 1982, 52, 291-302.
- Cooper, H. M., & Findley, M. Expected effect sizes: Es-

- timates for statistical power analysis in social psychology. *Personality and Social Psychology Bulletin*, 1982, 8, 168-173.
- Cottrell, N. B. Social facilitation. In C. G. McClintock (Ed.), *Experimental social psychology*. New York: Holt, Rinehart & Winston, 1972.
- Dashiell, J. F. Experimental studies of the influence of social situations on the behavior of individual human adults. In C. Murchison (Ed.), *A handbook of social psychology*. Worcester, Mass.: Clark University Press, 1935.
- Duval, S., & Wicklund, R. A. *A theory of objective self-awareness*. New York: Academic Press, 1972.
- Geen, R. G. The effects of being observed on performance. In P. B. Paulus (Ed.), *Psychology of group influence*. Hillsdale, N.J.: Erlbaum, 1980.
- Geen, R. G. Evaluation apprehension and social facilitation: A reply to Sanders. *Journal of Experimental Social Psychology*, 1981, 17, 252-256.
- Geen, R. G., & Gange, J. J. Drive theory of social facilitation: Twelve years of theory and research. *Psychological Bulletin*, 1977, 84, 1267-1288.
- Glass, G. V., McGaw, B., & Smith M. L. *Meta-analysis in social research*. Beverly Hills, Calif.: Sage, 1981.
- Goffman, E. *Interaction ritual*. Garden City, N.Y.: Doubleday, 1967.
- Greenwald, A. G. Consequences of prejudice against the null hypothesis. *Psychological Bulletin*, 1975, 82, 1-20.
- Guerin, B., & Innes, J. M. Social facilitation and social monitoring: A new look at Zajonc's mere presence hypothesis. *British Journal of Social Psychology*, 1982, 21, 7-18.
- Hedges, L. V., & Olkin, I. Vote-counting methods in research synthesis. *Psychological Bulletin*, 1980, 88, 359-369.
- Higbee, K. L., Millard, R. J., & Folkman, J. R. Social psychology research during the 1970s: Predominance of experimentation and college students. *Personality and Social Psychology Bulletin*, 1982, 8, 180-183.
- Hollingsworth, H. L. *The psychology of the audience*. New York: American Book, 1935.
- Hull, C. L. *Principles of behavior*. New York: Appleton-Century-Crofts, 1943.
- Hunter, J. E., Schmidt, F. L., & Jackson, G. B. *Meta-analysis: Cumulating research findings across studies*. Beverly Hills, Calif.: Sage, 1982.
- Landers, D. M., Bauer, R. S., & Feltz, D. L. Social facilitation during the initial stage of motor learning: A re-examination of Martens' audience study. *Journal of Motor Behavior*, 1978, 10, 325-337.
- Landers, D. M., & McCullagh, P. D. Social facilitation of motor performance. In J. Keogh & R. S. Hutton (Eds.), *Exercise and sport reviews* (Vol. 4). Santa Barbara, Calif.: Journal Publishing Affiliates, 1976.
- Light, R. J., & Smith, P. V. Accumulating evidence: Procedures for resolving contradictions among different research studies. *Harvard Educational Review*, 1971, 41, 429-471.
- Manstead, A. S. R., & Semin, G. R. Social facilitation effects: Mere enhancement of dominant responses? *British Journal of Social and Clinical Psychology*, 1980, 19, 119-136.
- Markus, H. The effect of mere presence on social facilitation: An unobtrusive test. *Journal of Experimental Social Psychology*, 1978, 14, 389-397.
- Moore, D. L., & Baron, R. S. Social facilitation: A psychophysiological analysis. In J. Cacioppi & R. Petty (Eds.), *Social psychophysiology: A sourcebook*. New York: Guilford Press, in press.
- Myers, J. L. *Fundamentals of experimental design* (3rd ed.). Boston: Allyn & Bacon, 1979.
- Pessin, J. The comparative effects of social and mechanical stimulation on memorizing. *American Journal of Psychology*, 1933, 45, 263-270.
- Rachman, S. J., & Wilson, G. T. *The effects of psychological therapy* (2nd ed.). New York: Pergamon Press, 1980.
- Rhine, J. B., Pratt, J. G., Stuart, C. E., Smith, B. M., & Greenwood, J. A. *Extrasensory perception after sixty years*. New York: Holt, 1940.
- Rosenthal, R. Combining results of independent studies. *Psychological Bulletin*, 1978, 85, 185-193.
- Rosenthal, R. The "file drawer problem" and tolerance for null results. *Psychological Bulletin*, 1979, 86, 638-641.
- Rosenthal, R., & Rubin, D. B. Comparing effect sizes of independent studies. *Psychological Bulletin*, 1982, 92, 500-504.
- Sanders, G. S. Driven by distraction: An integrative review of social facilitation theory and research. *Journal of Experimental Social Psychology*, 1981, 17, 227-251. (a)
- Sanders, G. S. Toward a comprehensive account of social facilitation: Distraction/conflict does not mean theoretical conflict. *Journal of Experimental Social Psychology*, 1981, 17, 262-265. (b)
- Sanders, G. S., Baron, R. S., & Moore, D. L. Distraction and social comparison as mediators of social facilitation effects. *Journal of Experimental Social Psychology*, 1978, 14, 291-303.
- Schachter, S. *The psychology of affiliation*. Stanford, Calif.: Stanford University Press, 1959.
- Schultz, D. P. The human subject in psychological research. *Psychological Bulletin*, 1969, 72, 214-228.
- Spence, K. W. *Behavior theory and conditioning*. New Haven, Conn.: Yale University Press, 1956.
- Tolman, C. W. The role of the companion in the social facilitation of animal behavior. In E. C. Simmel, R. A. Hoppe, & G. A. Milton (Eds.), *Social facilitation and imitative behavior*. Boston: Allyn & Bacon, 1968.
- Triplet, N. The dynamogenic factors in pacemaking and competition. *American Journal of Psychology*, 1898, 9, 507-533.
- Tukey, J. W. *Exploratory data analysis*. Reading, Mass.: Addison-Wesley, 1977.
- Weiss, R. F., & Miller, F. G. The drive theory of social facilitation. *Psychological Review*, 1971, 78, 44-57.
- Wicklund, R. A. Objective self-awareness. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 8). New York: Academic Press, 1975.
- Woolbert, C. H. The audience. *Psychological Monographs*, 1916, 21, 37-54.
- Zajonc, R. B. Social facilitation. *Science*, 1965, 149, 269-274.
- Zajonc, R. B. Compresence. In P. B. Paulus (Ed.), *Psychology of group influence*. Hillsdale, N.J.: Erlbaum, 1980.

(Appendix follows on next page)

Appendix

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- Abel, T. M. The influence of social facilitation on motor performance at different levels of intelligence. *American Journal of Psychology*, 1938, 51, 379-389.
- Abel, T. M. Social facilitation in different motor tasks. *Kwartalnik Psychologiczny*, 1939, 11, 162-169.
- Abrams, D., & Manstead, A. S. R. A test of theories of social facilitation using a musical task. *British Journal of Social Psychology*, 1981, 20, 271-278.
- Ader, R., & Tatum, R. Free-operant avoidance conditioning in individual and paired human subjects. *Journal of the Experimental Analysis of Behavior*, 1963, 6, 357-359.
- Allport, F. H. The influence of the group upon association and thought. *Journal of Experimental Psychology*, 1920, 3, 159-182.
- Allport, F. H. *Social psychology*. Cambridge, Mass.: Riverside Press, 1924.
- Amoroso, D. M., & Walters, R. H. Effects of anxiety and socially mediated anxiety reduction on paired-associate learning. *Journal of Personality and Social Psychology*, 1969, 11, 388-396.
- Anderson, C. A. An experimental study of "social facilitation" as affected by "intelligence." *American Journal of Sociology*, 1929, 34, 874-881.
- Baker, M. J. The effect of threat of evaluation on children's verbal learning as a function of sex of subject and social condition (Doctoral dissertation, Bryn Mawr College, 1976). *Dissertation Abstracts International*, 1977, 37, 4749B. (University Microfilms No. 77-6513)
- Baldwin, A. L., & Levin, H. Effects of public and private success or failure on children's repetitive motor behavior. *Child Development*, 1958, 29, 363-372.
- Bargh, J. A., & Cohen, J. L. Mediating factors in the arousal-performance relationship. *Motivation and Emotion*, 1978, 2, 243-257.
- Baron, R. A. Aggression as a function of audience presence and prior anger arousal. *Journal of Experimental Social Psychology*, 1971, 7, 515-523.
- Baron, R. S., Moore, D., & Sanders, G. S. Distraction as a source of drive in social facilitation research. *Journal of Personality and Social Psychology*, 1978, 36, 816-824.
- Baumeister, A. A., & Forehand, R. Social facilitation of body rocking in severely retarded patients. *Journal of Clinical Psychology*, 1970, 26, 303-305.
- Beatty, M. J. Social facilitation and listening comprehension. *Perceptual and Motor Skills*, 1980, 51, 1222.
- Beck, H. P., & Seta, J. J. The effects of frequency of feedback on a simple coercion task. *Journal of Personality and Social Psychology*, 1980, 38, 75-80.
- Bennett, M. W. Factors influencing performance on group and individual tests of intelligence: II. Social facilitation. *Journal of Educational Psychology*, 1946, 37, 347-358.
- Bergum, B. O., & Lehr, D. J. Vigilance performance as a function of paired monitoring. *Journal of Applied Psychology*, 1962, 46, 341-343.
- Bergum, B. O., Lehr, D. J. Effects of authoritarianism on vigilance performance. *Journal of Applied Psychology*, 1963, 47, 75-77.
- Berger, S. M., et al. Audience-induced inhibition of overt practice during learning. *Journal of Personality and Social Psychology*, 1981, 40, 479-491.
- Berkey, A. S., & Hoppe, R. A. The combined effect of audience and anxiety on paired-associates learning. *Psychonomic Science*, 1972, 29, 351-353.
- Berry, F. G. Relationships among social facilitation, extraversion-introversion, and their effects upon learning (Doctoral dissertation, Indiana University, 1974). *Dissertation Abstracts International*, 1975, 35, 6504A. (University Microfilms No. 75-8971)
- Bird, A. M. Effects of social facilitation upon females' performance of two psychomotor tasks. *Research Quarterly*, 1973, 44, 322-329.
- Birnbaum, A. S. G. Social correlates of field articulation in adolescents: The effect upon productivity in the presence of others (Doctoral dissertation, Hofstra University, 1975). *Dissertation Abstracts International*, 1975, 36, 1959B. (University Microfilms No. 75-23, 103)
- Blank, T. O. Observer and incentive effects on word association responding. *Personality and Social Psychology Bulletin*, 1980, 6, 267-272.
- Blank, T. O., Staff, I., & Shaver, P. Social facilitation of word associations: Further questions. *Journal of Personality and Social Psychology*, 1976, 34, 725-733.
- Bode, D. L., & Brutten, E. J. A palmar sweat investigation of the effect of audience variation upon stage fright. *Speech Monographs*, 1963, 30, 92-96.
- Bond, C. F., Jr. Performance in public: Drive theory and beyond (Doctoral dissertation, Duke University, 1980). *Dissertation Abstracts International*, 1980, 41, 1157B. (University Microfilms No. 80-19, 323)
- Borden, R. J., Hendrick, C., & Walker, J. W. Affective, physiological, and attitudinal consequences of audience presence. *Bulletin of the Psychonomic Society*, 1976, 7, 33-36.
- Borden, R. J., & Walker, J. W. Influence of self-observation versus other-observation on immediate and delayed recall. *Journal of General Psychology*, 1978, 99, 293-298.
- Bourg, M. S. The effects of peer presence upon the learning of a gross motor task by third-grade children (Doctoral dissertation, Florida State University, 1973). *Dissertation Abstracts International*, 1974, 34, 5684A. (University Microfilms No. 74-6587)
- Bray, R. M., & Sugarman, R. Social facilitation among interacting groups: Evidence for the evaluation-apprehension hypothesis. *Personality and Social Psychology Bulletin*, 1980, 6, 137-142.
- Brockner, J., & Hulton, A. J. B. How to reverse the vicious cycle of low self-esteem: The importance of attentional focus. *Journal of Experimental Social Psychology*, 1978, 14, 564-578.
- Brown, M., Amoroso, D. M., Ware, E. E., Pruesse, N., & Pilkey, D. W. Factors affecting viewing time of pornography. *Journal of Social Psychology*, 1973, 90, 125-135.
- Bruning, J. L., Capage, J. E., Kozuh, G. F., Young, P. F., & Young, W. E. Socially induced drive and range

- of cue utilization. *Journal of Personality and Social Psychology*, 1968, 9, 242-244.
- Buck, R. W., & Parke, R. D. Behavioral and physiological response to the presence of a friendly or neutral person in two types of stressful situations. *Journal of Personality and Social Psychology*, 1972, 24, 143-153.
- Burri, C. The influence of an audience upon recall. *Journal of Educational Psychology*, 1931, 22, 683-690.
- Burt, H. E. The inspiration-expiration ratio during truth and falsehood. *Journal of Experimental Psychology*, 1921, 4, 1-21.
- Burwitz, L., & Newell, K. M. The effects of the mere presence of coactors on learning a motor skill. *Journal of Motor Behavior*, 1972, 4, 99-102.
- Calcote, L. G. The interaction of extraversion, neuroticism, and audience presence in the performance of a choice reaction time task. Unpublished master's thesis, Northeastern State University, 1974. (ERIC Document Reproduction Service No. ED 112 286)
- Carment, D. W. Rate of simple motor responding as a function of coaction, competition, and sex of participants. *Psychonomic Science*, 1970, 19, 342-343.
- Carment, D. W. Rate of simple motor responding as a function of differential outcomes and the actual or implied presence of a coactor. *Psychonomic Science*, 1970, 20, 115-116.
- Carment, D. W., & Hodkin, B. Coaction and competition in India and Canada. *Journal of Cross-Cultural Psychology*, 1973, 4, 459-469.
- Carment, D. W., & Latchford, M. Rate of simple motor responding as a function of coaction, sex of participants, and the presence or absence of the experimenter. *Psychonomic Science*, 1970, 20, 253-254.
- Carpenter, R. J. The effects of five social conditions on performance of a complex learning task and a simple motor task (Doctoral dissertation, University of Denver, 1971). *Dissertation Abstracts International*, 1972, 32, 7287B. (University Microfilms No. 72-16, 937)
- Carron, A. V., & Bennett, B. The effects of initial habit strength differences upon performance in a coaction situation. *Journal of Motor Behavior*, 1976, 8, 297-304.
- Carver, C. S., & Scheier, M. F. Self-focusing effects of dispositional self-consciousness, mirror presence, and audience presence. *Journal of Personality and Social Psychology*, 1978, 36, 324-332.
- Carver, C. S., & Scheier, M. F. The self-attention-induced feedback loop and social facilitation. *Journal of Experimental Social Psychology*, 1981, 17, 545-568.
- Chapman, A. J. Social facilitation of laughter in children. *Journal of Experimental Social Psychology*, 1973, 9, 528-541.
- Chapman, A. J. An electromyographic study of social facilitation: A test of the "mere presence" hypothesis. *British Journal of Psychology*, 1974, 65, 123-128.
- Chapman, A. J. Humorous laughter in children. *Journal of Personality and Social Psychology*, 1975, 31, 42-49.
- Chapman, A. J., & Wright, D. S. Social enhancement of laughter: An experimental analysis of some companion variables. *Journal of Experimental Child Psychology*, 1976, 21, 201-218.
- Clark, N. J., & Fouts, G. T. Effects of positive, neutral, and negative experiences with an audience on social facilitation in children. *Perceptual and Motor Skills*, 1973, 37, 1008-1010.
- Cohen, J. L. Social facilitation: Increased evaluation apprehension through permanency of record. *Motivation and Emotion*, 1979, 3, 19-33.
- Cohen, J. L. Social facilitation: Audience versus evaluation apprehension effects. *Motivation and Emotion*, 1980, 4, 21-34.
- Cohen, J. L., & Davis, J. H. Effects of audience status, evaluation, and time of action on performance with hidden-word problems. *Journal of Personality and Social Psychology*, 1973, 27, 74-85.
- Colquhoun, W. P., & Corcoran, D. W. J. The effects of time of day and social isolation on the relationship between temperament and performance. *British Journal of Social and Clinical Psychology*, 1964, 3, 226-231.
- Cottrell, N. B., Rittle, R. H., & Wack, D. L. The presence of an audience and list type (competitive or non-competitive) as joint determinants of performance in paired-associates learning. *Journal of Personality*, 1967, 35, 425-434.
- Cottrell, N. B., Wack, D. L., Sekerak, G. J., & Rittle, R. H. Social facilitation of dominant responses by the presence of an audience and the mere presence of others. *Journal of Personality and Social Psychology*, 1968, 9, 245-250.
- Cox, F. N. Some effects of test anxiety and presence or absence of other persons on boys' performance on a repetitive motor task. *Journal of Experimental Child Psychology*, 1966, 3, 100-112.
- Cox, F. N. Some relationships between test anxiety, presence or absence of male persons, and boys' performance on a repetitive motor task. *Journal of Experimental Child Psychology*, 1968, 6, 1-12.
- Crabbe, J. M. Social facilitation effects on children during early stages of motor learning (Doctoral dissertation, University of Iowa, 1971). *Dissertation Abstracts International*, 1972, 32, 2463A. (University Microfilms No. 71-30, 420)
- Crandall, R. P. Influence of affective bonds on the social facilitation of multiple tasks (Doctoral dissertation, University of Michigan, 1974). *Dissertation Abstracts International*, 1975, 35, 5693B. (University Microfilms No. 75-10, 154)
- Criddle, W. D. The physical presence of other individuals as a factor in social facilitation. *Psychonomic Science*, 1971, 22, 229-230.
- Cummings, W. H. Audience observation as a noxious stimulus: Escape and punishment contingencies (Doctoral dissertation, University of Iowa, 1975). *Dissertation Abstracts International*, 1975, 36, 4224B. (University Microfilms No. 76-2111)
- Dashiell, J. F. An experimental analysis of some group effects. *Journal of Abnormal and Social Psychology*, 1930, 25, 190-199.
- Davidson, P. O., & Kelley, W. R. Social facilitation and coping with stress. *British Journal of Social and Clinical Psychology*, 1973, 12, 130-136.
- Davis, J. H., Carey, M. H., Foxman, P. N., & Tarr, D. B. Verbalization, experimenter presence, and problem-solving. *Journal of Personality and Social Psychology*, 1968, 8, 299-302.
- Deffenbacher, K. A., Platt, G. J., & Williams, M. A. Differential recall as a function of socially induced arousal and retention interval. *Journal of Experimental Psychology*, 1974, 103, 809-811.
- Dey, M. K. An attempt to analyze the effect of non-

- competitive co-acting groups. *Indian Journal of Psychology*, 1949, 24, 86-95.
- Dua, J. K. Effect of audience on the acquisition and extinction of avoidance. *British Journal of Social and Clinical Psychology*, 1977, 16, 207-212.
- Ekdahl, A. G. The effect of attitude on free word association-time. *Genetic Psychology Monographs*, 1929, 5, 253-338.
- Elliot, E. S., & Cohen, J. L. Social facilitation effects via interpersonal distance. *Journal of Social Psychology*, 1981, 114, 237-249.
- Epley, S. W., & Cottrell, N. B. Effect of presence of a companion on speed of escape from electric shock. *Psychological Reports*, 1977, 40, 1299-1308.
- Evans, J. F. Social facilitation in a competitive situation. *Canadian Journal of Behavioral Science*, 1971, 3, 276-281.
- Farnsworth, P. R. Concerning so-called group effects. *Journal of Genetic Psychology*, 1928, 35, 587-594.
- Farrelly, J. F. The effects of coactors, sex of coactors, and ability level upon performance of a simple motor task (Doctoral dissertation, Florida State University, 1976). *Dissertation Abstracts International*, 1977, 37, 7612A. (University Microfilms No. 77-13, 314)
- Fleming, M. F. Social facilitation effects upon selected cognitive activities including brainstorming carried out by eleventh and twelfth grade biology students (Doctoral dissertation, Pennsylvania State University, 1972). *Dissertation Abstracts International*, 1973, 33, 6727A. (University Microfilms No. 73-13, 976)
- Forgas, J. P., Brennan, G., Howe, S., Kane, J. F., & Sweet, S. Audience effects on squash players' performance. *Journal of Social Psychology*, 1980, 111, 41-47.
- Fouts, G. T. Charity in children: The influence of "charity" stimuli and an audience. *Journal of Experimental Child Psychology*, 1972, 13, 303-309.
- Fouts, G. T. Social anxiety and social facilitation. *Psychological Reports*, 1979, 44, 1065-1066.
- Fouts, G. T. Effect of sex of audience on speed of performance of preadolescents. *Perceptual and Motor Skills*, 1980, 51, 565-566.
- Fouts, G. T., & Jordan, L. The effect of an audience on free associations to emotional words. *Journal of Community Psychology*, 1973, 1, 45-47.
- Fouts, G. T., & Parton, D. A. Imitation by children in primary grades: Effects of vicarious habit and social drive. *Perceptual and Motor Skills*, 1974, 38, 155-160.
- Fraser, D. C. The relation of an environmental variable to performance in a prolonged visual task. *Quarterly Journal of Experimental Psychology*, 1953, 5, 31-32.
- Ganzer, V. J. Effects of audience presence and test anxiety on learning and retention in a serial learning situation. *Journal of Personality and Social Psychology*, 1968, 8, 194-199.
- Gastorf, J., Suls, J., & Sanders, G. S. Type A coronary-prone behavior pattern and social facilitation. *Journal of Personality and Social Psychology*, 1980, 38, 773-780.
- Gates, G. S. The effect of an audience upon performance. *Journal of Abnormal and Social Psychology*, 1924, 18, 334-342.
- Geen, R. G. Social facilitation of long-term recall. *Psychonomic Science*, 1971, 24, 89-90.
- Geen, R. G. Effects of being observed on short- and long-term recall. *Journal of Experimental Psychology*, 1973, 100, 395-398.
- Geen, R. G. Effects of evaluation apprehension on memory over intervals of varying length. *Journal of Experimental Psychology*, 1974, 102, 908-910.
- Geen, R. G. The role of the social environment in the induction and reduction of anxiety. In C. D. Spielberger & I. G. Sarason (Eds.), *Stress and anxiety* (Vol. 3). Washington, D.C.: Hemisphere Publishing, 1976.
- Geen, R. G. Test anxiety, observation, and range of cue utilization. *British Journal of Social and Clinical Psychology*, 1976, 15, 253-259.
- Geen, R. G. Effects of anticipation of positive and negative outcomes on audience anxiety. *Journal of Consulting and Clinical Psychology*, 1977, 45, 715-716.
- Geen, R. G. Effects of being observed on learning following success and failure experiences. *Motivation and Emotion*, 1979, 4, 355-371.
- Geen, R. G. Effects of being observed on persistence at an insoluble task. *British Journal of Social Psychology*, 1981, 20, 211-216.
- Gillen, R. W. Effects of an audience on serial association (Doctoral dissertation, University of Southern California, 1960). *Dissertation Abstracts International*, 1960, 20, 4728. (University Microfilms No. 60-1310)
- Glass, D. C., Gordon, A., & Henchy, T. The effects of social stimuli on psychophysiological reactivity to an aversive film. *Psychonomic Science*, 1970, 20, 255-256.
- Goggins, R. The relationships among extraversion, social facilitation, and short- and long-term recall (Doctoral dissertation, New York University, 1974). *Dissertation Abstracts International*, 1975, 35, 5153B. (University Microfilms No. 75-8544)
- Gore, W. V., & Taylor, D. A. The nature of the audience as it affects social inhibition. *Representative Research in Social Psychology*, 1973, 4, 18-27.
- Greenberg, C. I., & Firestone, I. J. Compensatory responses to crowding: Effects of personal space intrusion and privacy reduction. *Journal of Personality and Social Psychology*, 1977, 35, 637-644.
- Gribbin, K. J. Audience effect and age differences on tasks of increasing complexity (Doctoral dissertation, University of Southern California, 1974). *Dissertation Abstracts International*, 1974, 35, 1018B. (University Microfilms No. 74-17, 345)
- Haas, J., & Roberts, G. C. Effect of evaluative others upon learning and performance of a complex motor task. *Journal of Motor Behavior*, 1975, 7, 81-90.
- Hake, D. F., Vukelich, R., & Kaplan, S. J. Audit responses: Responses maintained by access to existing self or coactor scores during non-social, parallel work, and cooperation procedures. *Journal of the Experimental Analysis of Behavior*, 1973, 19, 409-423.
- Hall, E. G. Interaction of locus of control, sex, competition and coercion during performance of a novel motor task (Doctoral dissertation, University of Virginia, 1977). *Dissertation Abstracts International*, 1979, 39, 4121A. (University Microfilms No. 79-01, 151)
- Hamberger, L. K., & Lohr, J. M. Effects of trainer's presence and response-contingent feedback in biofeedback-relaxation training. *Perceptual and Motor Skills*, 1981, 53, 15-24.
- Hanawalt, N. G., & Ruttiger, K. F. The effect of an audience on remembering. *Journal of Social Psychology*, 1944, 19, 259-272.
- Harrell, W. A., & Schmitt, D. R. Effects of a minimal

- audience on physical aggression. *Psychological Reports*, 1973, 32, 651-657.
- Henchy, T., & Glass, D. C. Evaluation apprehension and the social facilitation of dominant and subordinate responses. *Journal of Personality and Social Psychology*, 1968, 10, 446-454.
- Herold, P. S. Evaluation apprehension and implied evaluation as co-determinants of social facilitation (Doctoral dissertation, Claremont Graduate School, 1974). *Dissertation Abstracts International*, 1974, 35, 543B. (University Microfilms No. 74-14, 882)
- Hicks, D. J. Effects of co-observer's sanctions and adult presence on imitative aggression. *Child Development*, 1968, 39, 303-309.
- Higgs, W. J., & Joseph, K. B. Effects of real and anticipated audiences on verbal learning and reproduction. *Journal of Social Psychology*, 1971, 85, 41-49.
- Hillery, J. M., & Fugita, S. S. Group size effects in employment testing. *Educational and Psychological Measurement*, 1975, 35, 745-750.
- Hollifield, N. L. Effect of prior performance experience before audiences on a dominant and nondominant motor response (Doctoral dissertation, Louisiana State University, 1979). *Dissertation Abstracts International*, 1980, 40, 6190A. (University Microfilms No. 80-13, 121)
- Hopstock, P. J. Personality and environmental determinants of the social facilitation effect (Doctoral dissertation, State University of New York at Stony Brook, 1974). *Dissertation Abstracts International*, 1975, 35, 4681B. (University Microfilms No. 75-4568)
- Houston, J. P. Effects of audiences upon learning and retention. *Journal of Experimental Psychology*, 1970, 86, 449-453.
- Hrycaiko, D. W., & Hrycaiko, R. B. Palmar sweating in an evaluative audience situation. *Journal of Social Psychology*, 1980, 111, 269-280.
- Hunt, P. J., & Hillery, J. M. Social facilitation in a coaction setting: An examination of the effects over learning trials. *Journal of Experimental Social Psychology*, 1973, 9, 563-571.
- Huntermark, J. M., & Witte, K. L. Vigilance performance as related to task instructions, coaction, and knowledge of results. *Bulletin of the Psychonomic Society*, 1978, 12, 325-328.
- Hutchinson, V. Q., & Cotten, D. J. Effects of audience and anxiety level on learning and performance of a complex gross motor skill by college women. *Perceptual and Motor Skills*, 1973, 36, 1103-1108.
- Innes, J. M. The effect of presence of co-workers and evaluative feedback on performance of a simple reaction time task. *European Journal of Social Psychology*, 1972, 2, 466-470.
- Innes, J. M., & Sambrooks, J. E. Paired-associate learning as influenced by birth order and the presence of others. *Psychonomic Science*, 1969, 16, 109-110.
- Innes, J. M., & Young, R. F. The effect of presence of an audience, evaluation apprehension, and objective self-awareness on learning. *Journal of Experimental Social Psychology*, 1975, 11, 35-42.
- Johnson, C. D., & Davis, J. H. An equiprobability model of risk-taking. *Organizational Behavior and Human Performance*, 1972, 8, 159-175.
- Johnson, E. S., & Baker, R. F. The computer as experimenter: New results. *Behavioral Science*, 1973, 18, 377-385.
- Johnson, K. M. The effect of passive audiences on the motor performance and autonomic arousal level of college women (Doctoral dissertation, University of Southern California, 1974). *Dissertation Abstracts International*, 1974, 35, 2752A. (University Microfilms No. 74-23, 590)
- Karst, T. O., & Most, R. A comparison of stress measures in an experimental analogue of public speaking. *Journal of Consulting and Clinical Psychology*, 1973, 41, 342-348.
- Kawamura-Reynolds, M. Motivational effects of an audience in the content of imaginative thought. *Journal of Personality and Social Psychology*, 1977, 35, 912-919.
- Khalique, N. Effects of the presence of similar and dissimilar individuals on the speed of verbal learning. *Psychologia*, 1979, 22, 95-98.
- Khalique, N. Effect of increased number of passive spectators on the speed of verbal learning. *Psychologia*, 1980, 23, 47-49.
- Kieffer, L. F. Relationship of trait anxiety, peer presence, task difficulty, and skill acquisition of sixth grade boys. *Research Quarterly*, 1977, 48, 550-561.
- Kiesler, S. B. Stress, affiliation, and performance. *Journal of Experimental Research in Personality*, 1966, 1, 227-235.
- Kissel, S. Stress-reducing properties of social stimuli. *Journal of Personality and Social Psychology*, 1965, 2, 378-384.
- Kleck, R. E., Vaughan, R. C., Cartwright-Smith, J., Vaughan, K. B., Colby, C. Z., & Lanzetta, J. T. Effects of being observed on expressive, subjective, and physiological responses to painful stimuli. *Journal of Personality and Social Psychology*, 1976, 34, 1211-1218.
- Klinger, E. Feedback effects and social facilitation of vigilance performance: Mere coaction versus potential evaluation. *Psychonomic Science*, 1969, 14, 161-162.
- Kobasigawa, A. Inhibitory and disinhibitory effects of models on sex-inappropriate behavior in children. *Psychologia*, 1968, 11, 86-96.
- Koch, C. G., Sloan, L. R., & Scholl, D. M. *Social facilitation: Effects of audience and manipulated feedback on performance*. Paper presented at the 83rd meeting of the American Psychological Association, Chicago, 1975.
- Kohfeld, D. L., & Weitzel, W. Some relations between personality factors and social facilitation. *Journal of Experimental Research in Personality*, 1969, 3, 287-292.
- Kozar, B. The effects of a supportive and nonsupportive audience upon learning a gross motor skill. *International Journal of Sport Psychology*, 1973, 4, 27-38.
- Krueger, W. C. Note concerning group influences upon Otis S. A. test scores. *Journal of Educational Psychology*, 1936, 27, 554-555.
- Kumar, P., & Kriplani, N. D. A study of differential effects of social situations on individual behavior. *Indian Journal of Experimental Psychology*, 1972, 6, 78-80.
- Kushnir, T., & Duncan, K. D. An analysis of social facilitation effects in terms of signal detection theory. *Psychological Record*, 1978, 28, 535-541.
- Landers, D. M. Observational learning of a motor skill: Temporal spacing of demonstrations and audience presence. *Journal of Motor Behavior*, 1975, 7, 281-287.

- Landers, D. M., Bauer, R. S., & Feltz, D. L. Social facilitation during the initial stage of motor learning: A re-examination of Martens' audience study. *Journal of Motor Behavior*, 1978, 10, 325-337.
- Landers, D. M., & Landers, D. M. Teacher versus peer models: Effects of model's presence and performance level on motor behavior. *Journal of Motor Behavior*, 1973, 5, 129-139.
- Larrance, D. T. Social facilitation and crowding: Their combined effect on simple and difficult task performance in evaluation and no-evaluation situations (Doctoral dissertation, University of Rochester, 1980). *Dissertation Abstracts International*, 1981, 41, 3233B. (University Microfilms No. 81-04, 312)
- Laughlin, P. R., Chenoweth, R. E., Farrell, B. B., & McGrath, J. E. Concept attainment as a function of motivation and task complexity. *Journal of Experimental Psychology*, 1972, 96, 54-59.
- Laughlin, P. R., & Jaccard, J. J. Social facilitation and observational learning of individuals and cooperative pairs. *Journal of Personality and Social Psychology*, 1975, 32, 873-879.
- Laughlin, P. R., & Wong-McCarthy, W. J. Social inhibition as a function of observation and recording of performance. *Journal of Experimental Social Psychology*, 1975, 11, 560-571.
- Lauver, R. A. Coaction effects on performance (Doctoral dissertation, Texas Woman's University, 1977). *Dissertation Abstracts International*, 1978, 38, 6602A. (University Microfilms No. 78-01, 768)
- Lennon, J. E. The effects of audience participation, audience composition, and personality syndrome on social facilitation (Doctoral dissertation, West Virginia University, 1974). *Dissertation Abstracts International*, 1975, 35, 7638A. (University Microfilms No. 75-12, 384)
- Levin, H., Baldwin, A. L., Gallwey, M., & Paivio, A. Audience stress, personality, and speech. *Journal of Abnormal and Social Psychology*, 1960, 61, 469-473.
- Livingston, M. V., Landers, D. M., & Dorrance, P. B. Comparison of coacting individuals' motor performance for varying combinations of initial ability. *Research Quarterly*, 1974, 45, 310-317.
- Lohss, W. E. Effects of the presence of another person in evaluative and nonevaluative roles on the performance of psychiatric patients and nonpatients (Doctoral dissertation, University of Illinois, 1970). *Dissertation Abstracts International*, 1971, 31, 7604B. (University Microfilms No. 71-14, 849)
- Lombardo, J. P., & Catalano, J. F. The effect of failure and the nature of the audience on performance of a complex motor task. *Journal of Motor Behavior*, 1975, 7, 29-35.
- Lombardo, J. P., & Catalano, J. F. Failure and its relationship to the social facilitation effect: Evidence for a learned drive interpretation of the social facilitation effect. *Perceptual and Motor Skills*, 1978, 46, 823-829.
- MacCracken, M. J. The effects of coaction and spectator conditions on young children's performance of simple and complex balance tasks (Doctoral dissertation, Kent State University, 1980). *Dissertation Abstracts International*, 1981, 41, 3478A. (University Microfilms No. 81-00, 703)
- Manstead, A. S. R., & Semin, G. R. Social facilitation effects: Mere enhancement of dominant responses? *British Journal of Social and Clinical Psychology*, 1980, 19, 119-136.
- Markus, H. The effect of mere presence on social facilitation: An unobtrusive test. *Journal of Experimental Social Psychology*, 1978, 14, 389-397.
- Martens, R. Effect of an audience on learning and performance of a complex motor skill. *Journal of Personality and Social Psychology*, 1969, 12, 252-260.
- Martens, R. Palmar sweating and the presence of an audience. *Journal of Experimental Social Psychology*, 1969, 5, 371-374.
- Martens, R., & Landers, D. M. Coaction effects on a muscular endurance task. *Research Quarterly*, 1969, 40, 733-737.
- Martens, R., & Landers, D. M. Evaluation potential as a determinant of coaction effects. *Journal of Experimental Social Psychology*, 1972, 8, 347-359.
- Marx, M. H., Witter, D. W., & Mueller, J. H. Interaction of sex and training method in human multiple-choice learning. *Journal of Social Psychology*, 1972, 88, 37-42.
- Mash, E. J., & Hedley, J. Effect of observer as a function of prior history of social interaction. *Perceptual and Motor Skills*, 1975, 40, 659-669.
- Matlin, M. W., & Zajonc, R. B. Social facilitation of word associations. *Journal of Personality and Social Psychology*, 1968, 10, 455-460.
- Matthews, G. M. Interpersonal attraction and stage of learning as determinants of social facilitation (Doctoral dissertation, University of Kentucky, 1968). *Dissertation Abstracts International*, 1970, 30, 3892B. (University Microfilms No. 70-2586)
- McCullagh, P. D., & Landers, D. M. Size of audience and social facilitation. *Perceptual and Motor Skills*, 1976, 42, 1067-1070.
- McDonald, P. S., & Bleichfeld, B. Audience effects as a function of performer's perceived task competence. Paper presented at the meeting of the Midwestern Psychological Association, Chicago, May, 1974.
- McGhee, P. E. Birth order and social facilitation of humor. *Psychological Reports*, 1973, 33, 105-106.
- Meddock, T. D., Parsons, J. A., & Hill, K. T. Effect of an adult's presence and praise on young children's performance. *Journal of Experimental Child Psychology*, 1971, 12, 197-211.
- Miller, F. G., Hurkman, M. F., Robinson, J. B., & Feinberg, R. A. Status and evaluation potential in the social facilitation and impairment of task performance. *Personality and Social Psychology Bulletin*, 1979, 5, 381-385.
- Miyamoto, M. Social facilitation in finger maze learning. *Japanese Psychological Research*, 1979, 21, 94-98.
- Moore, D., Logel, M. L., Weerts, T. C., Sanders, G. S., & Baron, R. S. Are audiences distracting? *Behavioral and physiological data*. Unpublished master's thesis, University of Iowa, 1978.
- Morrisette, J. O., Hornseth, J. P., & Shellar, K. Team organization and monitoring performance. *Human Factors*, 1975, 17, 296-300.
- Mukerji, N. P. An investigation of ability in work in groups and in isolation. *British Journal of Psychology*, 1940, 30, 352-356.
- Musante, G., & Anker, J. M. E's presence: Effect on S's performance. *Psychological Reports*, 1972, 30, 903-904.

- Musick, S. A., Beehr, T. A., & Gilmore, D. C. Effects of perceptions of presence of audience and achievement instructions on performance of a simple task. *Psychological Reports*, 1981, 49, 535-538.
- Newman, A., & Dickstein, R. Effect of being a model on scores on a performance IQ test. *Developmental Psychology*, 1976, 12, 355-356.
- Newman, A., Dickstein, R., & Gargan, M. Developmental effects in social facilitation and in being a model. *Journal of Psychology*, 1978, 99, 143-150.
- Paloutzian, R. F. Effects of deindividuation, removal of responsibility, and coaction on impulsive and cyclical aggression. *Journal of Psychology*, 1975, 90, 163-169.
- Paterson, C. E., Phillips, C. W., & Pettijohn, T. F. Environmental influences on a pegboard task. *Perceptual and Motor Skills*, 1980, 51, 533-534.
- Pattinson, M. D., & Pasewark, R. A. Effects of modeling and audience on an aversive task. *Psychological Reports*, 1980, 47, 879-882.
- Paulus, P. B., & Cornelius, W. L. An analysis of gymnastic performance under conditions of practice and spectator observation. *Research Quarterly*, 1974, 45, 56-63.
- Paulus, P. B., & Murdoch, P. Anticipated evaluation and audience presence in the enhancement of dominant responses. *Journal of Experimental Social Psychology*, 1971, 7, 280-291.
- Paulus, P. B., Shannon, J. C., Wilson, D. L., & Boone, T. D. The effect of spectator presence on gymnastic performance in a field situation. *Psychonomic Science*, 1972, 29, 88-90.
- Pederson, A. M. Effects of test anxiety and coacting groups on learning and performance. *Perceptual and Motor Skills*, 1970, 30, 55-62.
- Pessin, J. The comparative effects of social and mechanical stimulation on memorizing. *American Journal of Psychology*, 1933, 45, 263-270.
- Pessin, J., & Husband, R. W. Effects of social stimulation on human maze learning. *Journal of Abnormal and Social Psychology*, 1933, 28, 148-154.
- Phillips, V. K. The effects of social facilitation on creative behavior (Doctoral dissertation, University of Georgia, 1975). *Dissertation Abstracts International*, 1976, 36, 6451B. (University Microfilms No. 76-14, 011)
- Porter, H. V. K. Studies in the psychology of stuttering. XIV. Stuttering phenomena in relation to size and personnel of audience. *Journal of Speech Disorders*, 1939, 4, 323-333.
- Powell, F. M. Children's motor behavior under conditions of parental observation. Unpublished manuscript. Furman University, 1977. (ERIC Document Reproduction Service No. ED 141 365)
- Putz, V. R. The effects of different modes of supervision on vigilance behaviour. *British Journal of Psychology*, 1975, 66, 157-160.
- Quarter, J., & Marcus, A. Drive level and the audience effect: A test of Zajonc's theory. *Journal of Social Psychology*, 1971, 83, 99-105.
- Query, W. T., Moore, K. B., & Lerner, M. J. Social factors and chronic schizophrenia. *Psychiatric Quarterly*, 1966, 40, 504-514.
- Rajcecki, D. W., Ickes, W., Corcoran, C., & Lerner, K. Social facilitation of human performance: Mere presence effects. *Journal of Social Psychology*, 1977, 102, 297-310.
- Randall, V. W. Verbal and physiological behaviors as a function of birth order and social facilitation (Doctoral dissertation, Northern Illinois University, 1972). *Dissertation Abstracts International*, 1973, 33, 940B. (University Microfilms No. 72-22, 800)
- Reece, N. C. H. Effects of anomie and social facilitation on a paired associates verbal learning task (Doctoral dissertation, Mississippi State University, 1975). *Dissertation Abstracts International*, 1975, 36, 1401A. (University Microfilms No. 75-20, 731)
- Rittle, R. H., & Bernard, N. Enhancement of response rate by the mere physical presence of the experimenter. *Personality and Social Psychology Bulletin*, 1977, 3, 127-130.
- Rosenquist, H. S., & Shoberg, J. D. Social determinants in reversed alphabet printing. *Perceptual and Motor Skills*, 1968, 27, 600.
- Roth, J. T. Social facilitation in vigilance: Coaction and evaluation effects (Doctoral dissertation, Texas Technological University, 1977). *Dissertation Abstracts International*, 1977, 38, 3936B. (University Microfilms No. 77-31, 162)
- Rule, B. G., & Evans, J. F. Familiarization, the presence of others and group discussion effects on risk taking. *Representative Research in Social Psychology*, 1971, 2, 28-32.
- Sanders, G. S., Baron, R. S., & Moore, D. L. Distraction and social comparison as mediators of social facilitation effects. *Journal of Experimental Social Psychology*, 1978, 14, 291-303.
- Sasfy, J., & Okun, M. Form of evaluation and audience expertness as joint determinants of audience effects. *Journal of Experimental Social Psychology*, 1974, 10, 461-467.
- Scheier, M. F., Fenigstein, A., & Buss, A. H. Self-awareness and physical aggression. *Journal of Experimental Social Psychology*, 1974, 10, 264-273.
- Seidman, D., Benson, S. B., Miller, I., & Meeland, T. Influence of a partner on tolerance for a self-administered electric shock. *Journal of Abnormal and Social Psychology*, 1957, 54, 210-212.
- Sengupta, N. N., & Sinha, C. P. N. Mental work in isolation and in group. *Indian Journal of Psychology*, 1926, 1, 106-110.
- Seta, J. J., & Hassan, R. K. Awareness of prior success or failure: A critical factor in task performance. *Journal of Personality and Social Psychology*, 1980, 39, 70-76.
- Shaver, P., & Liebling, B. A. Explorations in the drive theory of social facilitation. *Journal of Social Psychology*, 1976, 99, 259-271.
- Shrauger, J. S. Self-esteem and reactions to being observed by others. *Journal of Personality and Social Psychology*, 1972, 23, 192-200.
- Siegel, G. M., & Haugen, D. Audience size and variations in stuttering behavior. *Journal of Speech and Hearing Research*, 1964, 7, 381-388.
- Simmel, E. C., Baker, E., & Collier, S. M. Social facilitation of exploratory behavior in preschool children. *Psychological Record*, 1969, 19, 425-430.
- Singer, R. N. Effect of spectators on athletes and non-athletes performing a gross motor task. *Research Quarterly*, 1965, 36, 473-482.
- Singer, R. N. Effect of an audience on performance of

- a motor task. *Journal of Motor Behavior*, 1970, 2, 88-95.
- Slevin, R. L. The influence of trait and state anxiety upon the performance of a novel gross motor task under conditions of competition and audience (Doctoral dissertation, Louisiana State University, 1970). *Dissertation Abstracts International*, 1971, 31, 3941A. (University Microfilms No. 71-3443)
- Smith, L. E., & Crabbe, J. Experimenter role relative to social facilitation and motor learning. *International Journal of Sport Psychology*, 1976, 7, 158-168.
- Smith, T. L. The effect of coactors upon the motor performance of male and female subjects of different ages (Doctoral dissertation, Louisiana State University, 1972). *Dissertation Abstracts International*, 1973, 33, 2154A. (University Microfilms No. 72-28, 382)
- Soukup, M. A., & Somervill, J. W. Effects of sex role and an audience on approaching a snake by mildly fearful subjects. *Perceptual and Motor Skills*, 1979, 49, 572.
- Steigleder, M. K., Weiss, R. F., Balling, S. S., Wenninger, V. L., & Lombardo, J. P. Driveline motivational properties of competitive behavior. *Journal of Personality and Social Psychology*, 1980, 38, 93-104.
- Steinke, J. M. Paired-associate learning as a function of test anxiety and audience effects (Doctoral dissertation, Northern Illinois University, 1973). *Dissertation Abstracts International*, 1973, 34, 1265B. (University Microfilms No. 73-20, 564)
- Street, W. R. Brainstorming by individuals, coacting and interacting groups. *Journal of Applied Psychology*, 1974, 59, 433-436.
- Strube, M. J., Miles, M. E., & Finch, W. H. The social facilitation of a simple task: Field tests of alternative explanations. *Personality and Social Psychology Bulletin*, 1981, 7, 701-707.
- Terris, W., & Rahhal, D. K. Generalized resistance to the effects of psychological stressors. *Journal of Personality and Social Psychology*, 1969, 13, 93-97.
- Thayer, R. E., & Moore, L. E. Reported activation and verbal learning as a function of group size (social facilitation) and anxiety-inducing instructions. *Journal of Social Psychology*, 1972, 88, 277-287.
- Thelen, M. H., Rehagen, N. J., & Akamatsu, T. J. Model reward and imitation: The effect of the presence of the experimenter and the model rewarder. *Journal of Psychology*, 1974, 87, 311-318.
- Travis, L. E. The effect of a small audience upon eye-hand coordination. *Journal of Abnormal and Social Psychology*, 1925, 20, 142-146.
- Travis, L. E. The influence of the group upon the stutterer's speed in free associations. *Journal of Abnormal and Social Psychology*, 1928, 23, 45-51.
- Triplett, N. E. The dynamogenic factors in pacemaking and competition. *American Journal of Psychology*, 1898, 9, 507-533.
- Van Tuinen, M., & McNeel, S. P. A test of the social facilitation theories of Cottrell and Zajonc in a coaction situation. *Personality and Social Psychology Bulletin*, 1975, 1, 604-607.
- Wankel, L. M. Competition in motor performance: An experimental analysis of motivational components. *Journal of Experimental Social Psychology*, 1972, 8, 427-437.
- Wankel, L. M. The effects of social reinforcement and audience presence upon the motor performance of boys with different levels of initial ability. *Journal of Motor Behavior*, 1975, 7, 207-216.
- Wankel, L. M. Audience size and trait anxiety effects upon state anxiety and motor performance. *Research Quarterly*, 1977, 48, 181-186.
- Wapner, S., & Alper, T. G. The effect of an audience on behavior in a choice situation. *Journal of Abnormal and Social Psychology*, 1952, 47, 222-229.
- Warnick, D. H. Social facilitation and facial composites (Doctoral dissertation, State University of New York at Albany, 1980). *Dissertation Abstracts International*, 1980, 41, 2831B. (University Microfilms No. 80-25, 898)
- Weiss, R. F., Miller, F. G., Langen, C. J., & Cecil, J. S. Social facilitation of attitude change. *Psychonomic Science*, 1971, 22, 113-114.
- Weston, S. B., & English, H. B. The influence of the group on psychological test scores. *American Journal of Psychology*, 1926, 37, 600-601.
- Williams, J. M. Effects of evaluative and non-evaluative coactors upon male and female performance of simple and complex motor tasks. In R. W. Christina & D. M. Landers (Eds.), *Psychology of motor behavior and sport—1976*. Champaign, Ill.: Human Kinetics Publishers, 1977.
- Wolfgang, A. Effects of social cues and task complexity in concept identification. *Journal of Educational Psychology*, 1967, 58, 36-40.
- Zajonc, R. B., & Sales, S. M. Social facilitation of dominant and subordinate responses. *Journal of Experimental Social Psychology*, 1966, 2, 160-168.
- Zajonc, R. B., Wolosin, R. J., Wolosin, M. A., & Low, W. D. Social facilitation and imitation in group risk-taking. *Journal of Experimental Social Psychology*, 1970, 6, 26-46.
- Zucker, S. H. *Social facilitation of retardate performance*. Paper presented at the Annual International Convention of the Council for Exceptional Children, Chicago, April, 1976. (ERIC Document Reproduction Services No. ED 125 194)

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